Railway Age Gazette

PUBLISHED EVERY FRIDAY AND DAILY EIGHT TIMES IN JUNE BY THE
SIMMONS-BOARDMAN PUBLISHING COMPANY
WOOLWORTH BUILDING, NEW YORK.

CHICAGO: Transportation Bldg. CLEVELAND: Citizens' Bldg.
LONDON: Queen Anne's Chambers, Westminster.

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Subscriptions, including 52 regular weekly issues and special daily editions published from time to time in New York, or in places other than New York, payable in advance and postage free:

United States and Mexico..... $5.00
Canada 6.00
Foreign Countries (excepting daily editions)..... 8.00
Single copies.....15 cents each

Engineering and Maintenance of Way Edition and four Maintenance of Way Convention daily issues, North America, $1; foreign, $2.

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

WE GUARANTEE, that of this issue (the monthly Engineering & Maintenance Edition), 10,700 copies were printed; that of these 10,700 copies, 7,209 were mailed to regular paid subscribers to the weekly edition, 1,845 to subscribers who get the Engineering & Maintenance Edition only, 146 were provided for counter and news companies' sales, 1,054 were mailed to advertisers, exchanges and correspondents, and 446 were provided for new subscriptions, samples, copies lost in the mail and office use; that the total copies printed this year to date were 396,450, an average of 9,228 copies a week.

The RAILWAY AGE GAZETTE and all other Simmons-Boardman publications are members of the Audit Bureau of Circulations.

VOLUME 59 OCTOBER 22, 1915 No. 17

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*Illustrated.

The Cold Straightening of Rails

A letter to the editor, by Robert W. Hunt, on another page, reviews the development of rail straightening and calls attention to the constant danger of serious injury to the rail as a result of the rough treatment which it now receives while undergoing this process. The elimination of occasion for concern from this cause by a departure from the present practice in the straightening of rails will not solve the rail problem, but it does seem to offer an opportunity for improvement and merits consideration. The letter confirms the findings of Dr. P. H. Dudley, as reported by him in the discussion of the report of the Rail Committee of the American Railway Engineering Association last March, although the solution of the problem offered differs somewhat in detail from that suggested by Dr. Dudley. Captain Hunt's plan will meet with approbation from some sources and also with no less emphatic objection. Bowed rails will not pile and load into cars as conveniently as straight ones, and it is to be expected that the laying of such rail on tangent track will be a source of some inconvenience and result in increased labor cost. These and other objections must be answered. We hope that Captain Hunt's letter will call forth discussion of this question raised from all points of view.

Financial Results of the Panama Canal

The Panama Canal in the fiscal year ending June 30, 1915, cost the taxpayers of the United States about $10,000,000. This sum represents the interest at 3 per cent on the cost of the canal, less the amount by which the tolls earned during the year exceeded the expenses of canal operation and maintenance. Some of the taxpayers, including the owners of steamship lines and shippers of freight to and from the Atlantic and Pacific seaboard territory, have profited greatly by the canal and doubtless are satisfied to pay a share of the expense. Others, including the shippers of the Middle West and the railroads, have been injured in their business, but they pay their share of the taxes just the same. The tolls earned by the canal during the year amounted to $4,343,383, and the expenses of operation and maintenance to $4,066,727. This makes the excess of tolls earned over expenses amount to $276,656, and, according to the Canal Record, the official publication of the Panama Canal, which publishes the figures, this "represents a *profit* of 6.7 per cent on the expenditure for operation and maintenance alone, not counting anything for interest on the money invested or for depreciation of plant." If the railroads of the United States could keep their accounts in this way there would not now be nearly 42,000 miles of road in the hands of receivers. If the railroads could calculate their profits as a percentage of their expenses they would present a striking appearance of prosperity, since a road with an operating ratio of 70 would show a "profit" of approximately 42 per cent. This is not, however, the most important difference between the methods of accounting of the canal authorities and the railways. The immediate cause for the receivership of a railroad is usually its inability to pay the interest on its bonds. Government enterprises encounter no such difficulty, because their accounts usually include only receipts and expenditures, and the little matter of interest on bonds is taken care of elsewhere. This enables the Canal Record to use the word "profit," whereas the *Railway Age Gazette* in a review of the year's operations of a railroad that had earned less than one-fortieth of the interest on its investment would be obliged to employ some expression signifying "deficit." The Canal Record does not attempt to conceal the facts. In the last paragraph of its review it says: "If, however, consideration be given to the interest on the money invested, which is a regular consideration from a commercial point of view, the profit vanishes. The money invested by the United States in the enterprise is approximately $360,000,000. The interest on this at 3 per cent

(which is the rate of interest on the last bonds issued for the canal work) amounts to $10,800,000." In the discussion of a railroad's annual report this rather troublesome detail usually demands a degree of attention somewhat earlier in the story. The revenues of the Panama Railroad and its steamship line were $2,787,056 and $2,642,457, respectively, while the expenses were $2,607,479 and $2,142,603, giving a net revenue from rail and steamship operations of $679,430. The net cost of other business operations in connection with the canal during the year was $2,469,642, and the canal zone government cost $288,887. With a profit of $71,234 from commissary operations, deficits from the operation of the Hotel Washington and of plantations, and a revenue from land rentals, the total revenues of the combined canal, railroad and steamship enterprise were $19,236,818, and the total expenses were $18,283,315, leaving an excess of revenues over expenses of $953,502, which would not go very far toward paying interest on the investment.

RAILROAD BANKRUPTCY

IN last week's issue of the *Railway Age Gazette* there was a table showing the mileage and outstanding securities of each one of the roads now in the hands of receivers. It may be recalled that this mileage amounted to one-sixth of the total mileage of railroads in the United States. The total par value of securities issued against this approximately 42,000 miles of road in the hands of receivers is $2,264,000,000, or about $54,000 per mile. Of the total 41,988 miles in receivers' hands, 34,902 miles are Class 1 roads reporting monthly earnings to the Interstate Commerce Commission, and the revenues, expenses and net operating income for these roads were published in the *Railway Age Gazette* of September 24. Net operating income is the total amount which the company has left after paying its operating expenses and taxes. From this it must pay the interest on its bonds, its rentals and its dividends to its stockholders.

If the railroad business were in a prosperous condition, and bankers and investors had confidence in the stability of railroad earnings, a company which was earning 7 per cent on the total cost of its property, if one-third of its capital was raised through the sale of bonds and two-thirds through the sale of stock, would have stock selling at approximately par and bonds on a 5 per cent basis, and assuming that the company had sold its bonds at about a 5 per cent basis, the company could, with a fair degree of safety, pay 6 per cent dividends. In other words, net income equal to 7 per cent on total capitalization would provide for 5 per cent on borrowed money, 6 per cent on stock, and a fair margin of safety in the form of surplus.

The Pennsylvania is a 6 per cent stock and is now selling at about 114 per cent of par; the Southern Pacific is paying 6 per cent and is selling at about 96 per cent of par; the Atchison, Topeka & Santa Fe is paying 6 per cent, and its stock is selling at about 106 per cent of par. Some of the bonds of these roads are selling on a lower yield basis than 5 per cent, but new bonds certainly could not be sold at anything less than 5 per cent. Investors are assuming that there will be the necessary fair margin of safety over the 6 per cent on the stock—that is, that these companies are likely to earn about 7 per cent on their total capitalization. Taking 7 per cent, therefore, as a fair minimum which net operating income ought to average on total capitalization, it is interesting to see what capitalization per mile of line each one of the roads in the hands of receivers could be given on the basis of its 1915 net operating income. The following table shows these figures:

	Mileage	Net Operating Income	(a)	(b)
Atlanta, Birmingham & Atlantic	642	$133,807	$1,911,529	$2,964
Chicago & Eastern Illinois	1,282	1,967,224	28,103,200	21,921
Chicago, Peoria & St. Louis	255	119,732	28,103,200	21,921
Cincinnati, Hamilton & Dayton	1,011	721,710	10,310,142	10,198
Colorado Midland	338	47,895	684,214	2,024
International & Great Northern	1,160	806,500	11,521,429	9,932
Missouri & North Arkansas	365	*221,619	.....	.....
Missouri, Oklahoma & Gulf	334	*177,113	.....	.....
New Orleans, Mobile & Chicago	403	374,129	5,344,700	13,262
New Orleans, Texas & Mexico	286	110,051	1,572,157	5,497
Pere Marquette	2,314	4,069,504	58,135,771	25,123
Pittsburgh, Shawmut & Northern	294	365,371	5,219,586	17,754
St. Louis & San Francisco	4,747	11,755,204	167,931,486	35,376
St. Louis, Brownsville & Mexico	548	525,267	7,503,814	13,693
St. Louis, San Francisco & Texas	235	1,278	18,257	77
Tennessee Central	294	165,270	2,361,000	8,031
Toledo, St. Louis & Western	451	888,922	1,269,889	2,816
Trinity & Brazos Valley	328	*62,134	.....	.....
Wabash	2,519	4,931,005	70,442,929	27,965
Wheeling & Lake Erie	512	1,002,407	14,320,100	27,969
Chicago, Rock Island & Pacific	7,855	13,415,308	191,647,257	24,398
Missouri, Kansas & Texas	3,865	8,584,604	122,637,200	31,730
Missouri Pacific	3,921	5,390,773	77,011,043	19,462
Western Pacific	943	931,305	13,304,357	14,109

* Deficit.
(a) Capitalization on which net operating income would yield 7 per cent.
(b) Capitalization per mile on which net operating income would yield 7 per cent.

The average capitalization per mile on which all the 34,902 miles of road reporting monthly earnings to the Interstate Commerce Commission could earn 7 per cent is $22,858. This on its face is utterly inadequate. Of the roads in the hands of receivers only two are earning a net operating income which would be 7 per cent on anything that might conceivably be their actual cost per mile. These are the St. Louis & San Francisco, earning 7 per cent on $35,376 per mile, and the Missouri, Kansas & Texas, earning 7 per cent on $31,730 per mile.

At the recent hearing on valuation it was pointed out that the best method of arriving at estimates of the present cost of reproduction of the railroads in the United States would be to base the estimates on the actual experience of companies which have built new mileage recently. The Pacific coast extension of the Chicago, Milwaukee & St. Paul cost at the very least an average of from sixty to seventy thousand dollars per mile. This may be somewhat higher than would be the cost of building the entire St. Louis & San Francisco, but probably not a great deal higher, when we taken into consideration stations, yards, shops, right of way and equipment; but the St. Louis & San Francisco and the Missouri, Kansas & Texas are in a class by themselves among the roads in the hands of receivers. The International & Great Northern is earning 7 per cent on less than $10,000 per mile; the Chicago & Eastern Illinois, a far more expensive road to build per mile than the average of the St. Louis & San Francisco, is earning 7 per cent on only $21,921 per mile; the Missouri Pacific, running through a territory where the right of way alone, including the terminals, would amount to more than six thousand dollars a mile, is earning 7 per cent on $19,462 per mile.

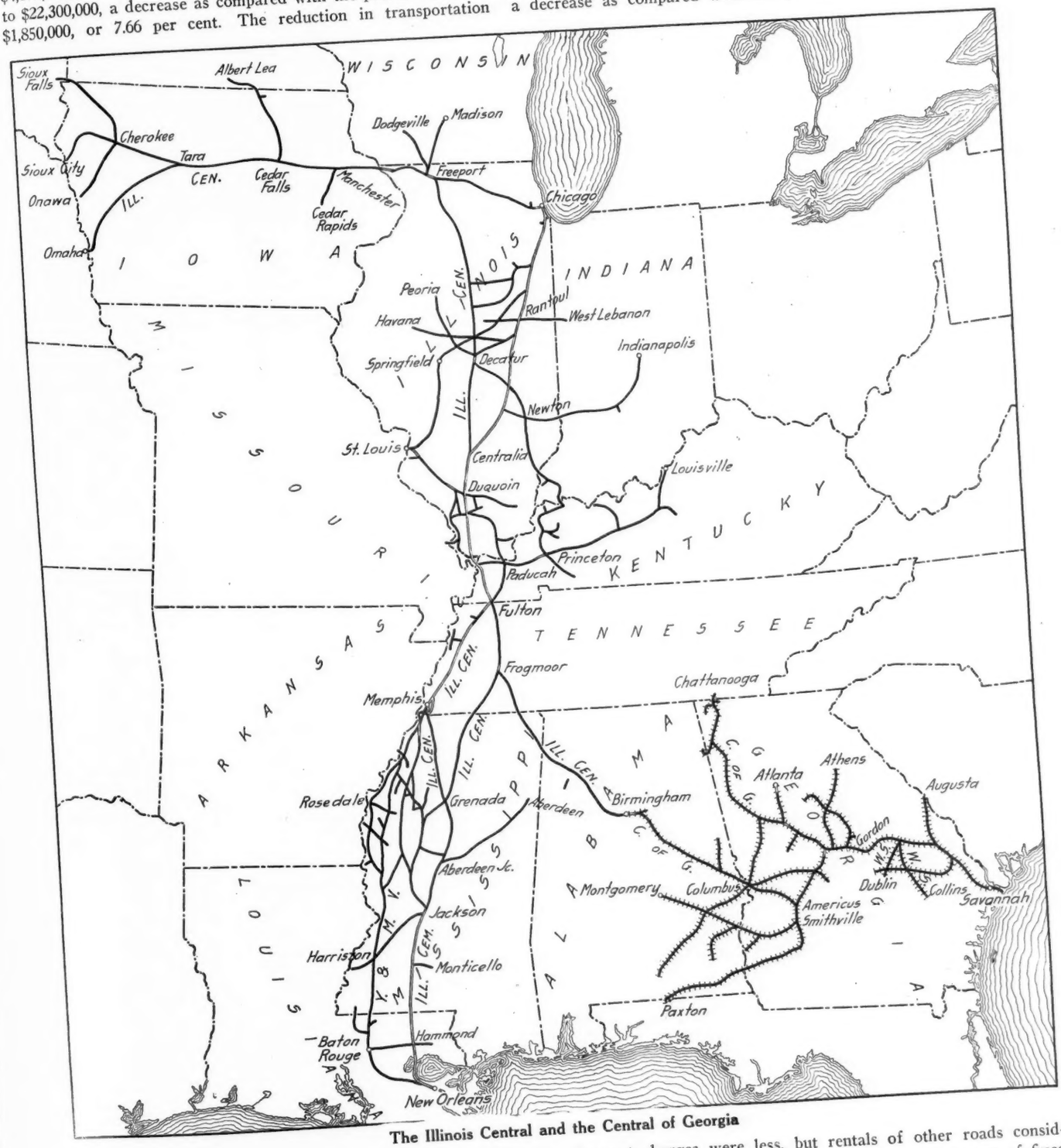
There are only three possible assumptions: Either that these roads are not needed by the country which they serve and that the loss which investors have sustained and which they face is due to the business mistake of building them, and that therefore a scaling down of securities to represent the earning power of the roads could not be considered confiscation; or that these roads are being operated so poorly that the wastes, if eliminated, would make up the difference between 7 per cent on the amount shown per mile in our table and 7 per cent on what the roads would actually cost to build; or, lastly, that rates fixed by state commissions and the Interstate Commerce Commission are low to the point which is plainly confiscatory as affecting these roads. Since most of the business is competitive, if these roads are to have higher rates their competitors also must be given higher rates. Whether or not there would be any way of compelling commissions to do this through the courts is questionable, but this is a larger question than simply a legal one. The commissions and public opinion must in the end be guided by economic principles, from which there is no escape.

As to whether or not the roads should have been built and are needed to serve the territory which they now serve, it would be interesting to stop their operation for just one day and then receive the opinion of the people living in the territory served.

ILLINOIS CENTRAL

THE Illinois Central made a saving in transportation expenses in the fiscal year ended June 30, 1915, enough to offset almost half of the loss in operating revenue due to business depression and especially to the depression in the lumber business and in the South. In 1915 total operating revenues amounted to $61,700,000, a decrease as compared with the previous year of $4,173,000, or 6.34 per cent. Transportation expenses amounted to $22,300,000, a decrease as compared with the previous year of $1,850,000, or 7.66 per cent. The reduction in transportation expenses in greater proportion than the reduction in business is credited to the substitution of superheater locomotives on main line for saturated steam locomotives; a successful fuel economy campaign, which was probably also helped by the superheater locomotives, and a reduction in payments for loss and damage to freight of 27.48 per cent. The trainload of revenue and company freight in 1915 was 523 tons as against 488 tons the year before, and the showing per locomotive mile was even better, the average tons of freight per revenue service locomotive mile being 509 in 1915 as against 471 in 1914.

In addition to the reduction in transportation expenses there was a reduction in both maintenance or way and maintenance of equipment, total operating expenses amounting to $47,570,000, a decrease as compared with the previous year of $3,205,000. Interest charges were less, but rentals of other roads considerably more, so that the net income, after the payment of fixed charges and rentals, was $6,859,000 in 1915 as against $8,139,000 in 1914. The 5 per cent dividends called for $5,465,000, so that



The Illinois Central and the Central of Georgia

in the fiscal year 1915 the company had a surplus of $1,240,000.

The expense for maintenance of way and structures was $8,839,000 in 1915, a reduction of 3.98 per cent, most of which reduction was the result of $217,000 less spent for rails and $206,000 less for general repairs of roadway and track, the latter item being affected by the fact that the 1914 expenses on this account were abnormally large because of the charges to maintenance incidental to betterment work and new construction work at Memphis. In 1915 a liberal policy as to tie renewals was pursued, the tie renewals being equal to 673 miles of track, or nearly 9 per cent of all ties in track, including sidings.

Maintenance of equipment cost $13,892,000, or 4.26 per cent less than in the preceding year, and the reduction was the result of repairs to fewer freight-train cars due, at least in part, to a reduction in freight car mileage. The company spent $2,351,000 for additions and betterments to its own line, but of this, $624,000 was transferred to "miscellaneous physical property." In addition there was $6,094,000 advanced to subsidiary companies. The Illinois Central also spent $2,503,000 for new equipment, against which there was issued $1,980,000 equipment trust certificates, series C. On July 1, $10,780,000 4½ per cent notes matured and were paid, the company having had on hand June 30, 1914, $10,859,000 cash. At the end of the year the company had $2,586,000 cash and during the year had borrowed $1,000,000. Total current liabilities, including this $1,000,000 loans and bills payable, amounted at the end of the year to $15,304,000 and current assets, including the cash mentioned previously, to $20,415,000.

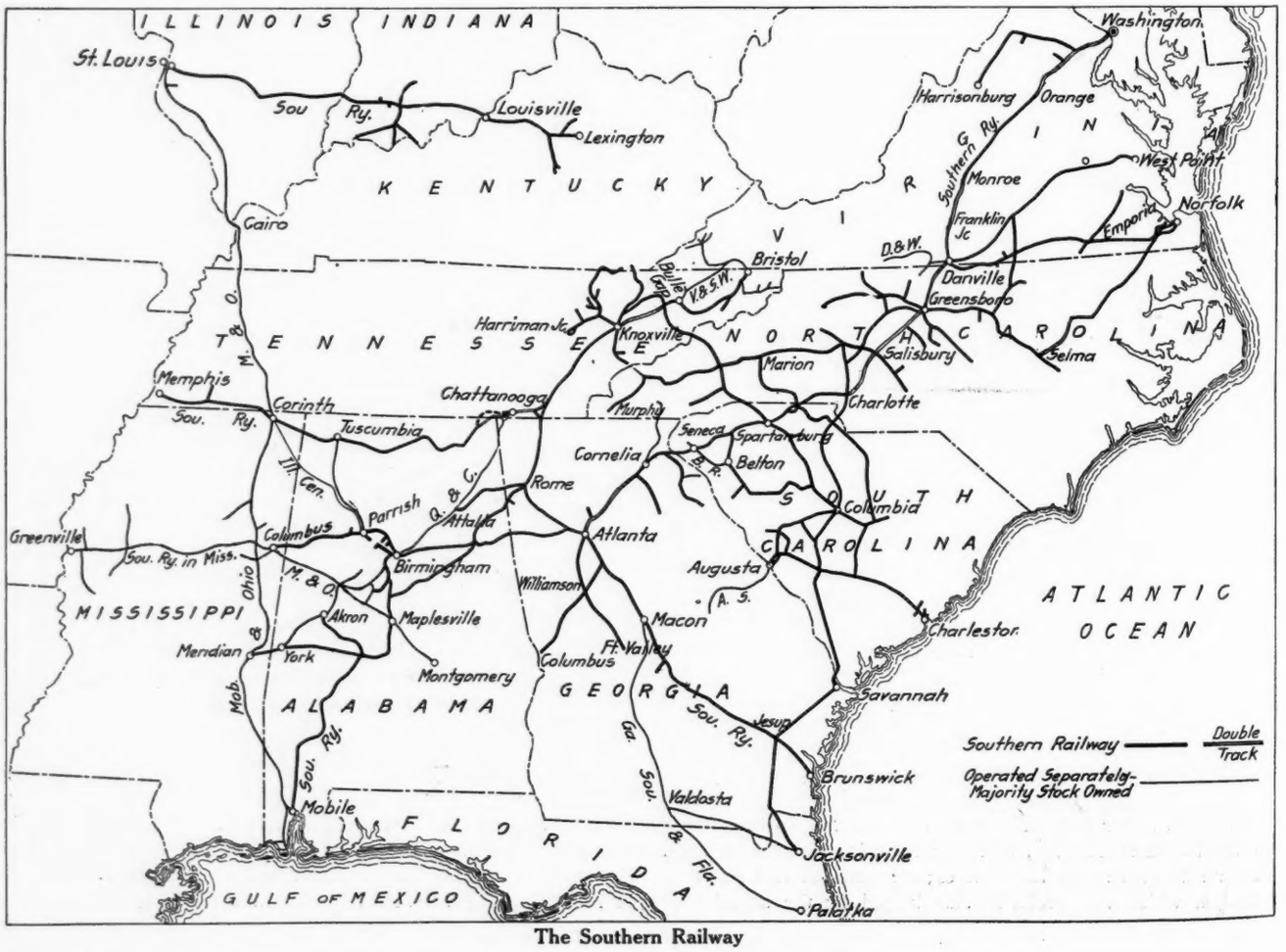
The total tonnage of freight carried on the Illinois Central in 1915 was 31,309,000, comparing with 32,343,000 carried the year before. Of the total carried in 1915, 45.15 per cent was products of mines, 19.00 per cent products of agriculture, 12.48 per cent lumber and 8.28 per cent manufactures. The tonnage of products of mines was 14,136,000, as compared with 13,843,000 in 1914. On the other hand, the tonnage of lumber was 3,906,000 in 1915 as against 4,804,000 in 1914.

The following table shows the principal figures for operation in 1915 as compared with 1914:

	1915.	1914.
Average mileage operated	4,770	4,769
Freight revenue	$41,212,271	$43,871,272
Passenger revenue	12,640,597	13,715,979
Total operating revenues	61,700,372	65,873,700
Maint. of way and structures	8,839,472	9,205,946
Maintenance of equipment	13,892,444	14,510,079
Traffic expenses	1,238,440	1,290,778
Transportation expenses	22,299,815	24,150,040
General expenses	1,603,256	1,618,484
Transportation for investment—Cr.	303,279	.....
Total operating expenses	47,570,148	50,775,327
Taxes	3,233,838	3,341,247
Operating income	10,878,473	11,739,475
Gross income	18,537,901	19,060,075
Net income	6,859,162	8,138,824
Sinking fund and other appropriations	153,903	41,643
Dividends	5,464,800	5,464,800
Surplus	1,240,460	2,632,381

SOUTHERN RAILWAY

IN 1908 a sudden loss of $3,716,000 in total operating revenues of the Southern Railway, representing a decrease, as compared with the previous year, of 6.56 per cent., caused the almost entire suspension of capital expenditures and, taken in connection with the after-panic conditions of that year, threatened the company with receivership. In the fiscal year ended June 30, 1915, there was a loss of $8,551,000 in operating revenues, representing a decrease of 12.09 per cent., as compared with the previous year, and the company was able, by the suspension of dividends on its preferred stock and economies in operation, to get through the year with a surplus of $1,523,000, or only half a million dollars less than the previous year. Additions and betterment work, for which money had been raised in 1914, was continued, according to the original program, with the result that new money was spent in the South at the very time when



The Southern Railway

the states in that part of the country were most in need of it.

A suggestion of how this result was accomplished is contained in the statement that the increase in ton miles of revenue freight carried per mile of road in 1915 was 28.35 per cent. greater than in 1908, while the freight-train mileage in 1915 was 18.98 *less* than in 1908.

The loss in revenue in 1915 was sudden, almost beyond comprehension. In August there was a decrease in revenue, as compared with the same month of the year before, of 1.20 per cent.; in September, 8.33 per cent.; in October, 18.47; in November, 20.06; in December, 19.97, and in January, 18.93. As President Harrison says, "the South practically suspended for a time its industrial activities."

As briefly stated as possible, the general methods by which the management met this crisis were, a frank statement of its problems to the people of the South, with an explanation of the necessity for reducing passenger service so as to, in some measure, offset decrease in business; an appeal to the loyalty of its employees for redoubled efforts toward economy and efficiency; a generous sacrifice on the part of the officers in accepting a reduction in salaries, and a new effort on the part of the management to effect economies through better and more constant supervision; the application of the most scientific methods of operation, and ingenuity in devising means of handling business more economically.

State commissions and the most intelligent public opinion of the South gave their hearty co-operation in an attempt to reduce passenger service, and with a reduction of 14.57 per cent. in passengers carried one mile, there was a reduction of 8.29 per cent. in passenger-train mileage, and there was furthermore a reduction of 5.33 per cent. in transportation costs per passenger-train mile for enginemen, trainmen and fuel.

In describing the response of the officers and employees to the needs of the company, President Harrison says: "There has never been a year of the company's history in which the stockholders have had as much reason for pride in and appreciation of the officers and employees, their work, their spirit, their loyal self-sacrifice. The manner in which a grave emergency was met and dealt with illustrates at its best that discipline which distinguishes a true organization for a mere co-operative society. Our organization, which has in recent years been built and cemented by a strict adherence to the principle of promotion for merit and reliance upon men made on the road, who have faithfully stood by during all our vicissitudes, has proven in this year of need the greatest of the company's assets, for it has fought a losing fight and won."

The remarkable results obtained by supervision and more scientific railroading deserve far more space than can possibly be given to them in this review of the company's 1915 fiscal year. The Southern Railway operates 7,022 miles of line. There are seven main lines and a great net work of branch lines.

These main lines run from Potomac Yard (just outside of Washington, D. C.) to Atlanta, Ga., 644 miles; from Atlanta to Birmingham, Ala., 167 miles; from Salisbury, N. C., to Morristown, Tenn., 228 miles; from Bristol, Tenn., to Chattanooga, Tenn., 242 miles; from Greensboro, N. C., to Pinners Point, Va. (opposite Norfolk), 267 miles; from Ashville, N. C., to Columbia, S. C., 163 miles, and from Chattanooga, Tenn., to Brunswick, Ga., 428 miles, a total of 2,139 miles.

The program of physical betterment of the property which was begun in 1907 and was interrupted in 1908, and work on which has been carried on ever since, provides for grade reduction and double tracking of the main lines with the heaviest density, the principal main lines being that from Washington to Atlanta, with the introduction of automatic block signals, the elimination of grade crossings, the improvement of yard facilities and the reconstruction of a large number of passenger stations. All of these expenditures, except the last, contribute more or less directly to more economical operation. The branch lines even yet are more than adequate for the greatest traffic which they have ever had to handle or will have to handle in the near future. Freight to or from points on branch lines is handled in local trains.

Not only have ratings been established for through freight trains, but astonishing results have been obtained by increasing the loading of local trains. The rating and heavier loading of locomotives in local train service began in March, 1914. In that month the average trainload for local trains was 192 tons. In June, 1915, the average trainload was 362 tons, or an increase of 88.50 per cent. The average trainload for the entire system was 382 tons in 1915 as against 339 tons in 1914, an increase of 12.71 per cent. In 1915, on 14 heavy traffic divisions in the direction of heavy traffic, 94.90 per cent. of available locomotive power was utilized, as against 87.40 per cent. in 1914, and in the direction of light traffic, 77.80 per cent., as against 71.50 per cent. Some idea of how these results were obtained may be gained from the fact that in 1914 through freights on one division handled 14,157,000 gross ton miles, with 9,405 engine miles, and local freights handled 2,826,000 gross ton miles, with 4,780 engine miles. In 1915 through freights handled 3,743,000 gross ton miles, with 1,732 engine miles, and local freights, 7,704,000 gross ton miles, with 3,975 engine miles. Thus by better loading the tons per engine mile in through freight service was increased by 43.60 per cent., and by a shifting of freight into local service and better loading the tons per engine mile in local freights increased by 228 per cent. On all 14 of the heavy traffic divisions the average increase in net tons per engine mile for through freights in June, 1915, as compared with June, 1914, was 13.70 per cent., and for local freights, 62.30 per cent. The results of this kind of supervision and resulting improvement in operating methods are reflected in transportation expenses, which amounted in 1915 to $22,758,000, or $2,956,000 (11.50 per cent) less than in 1914.

Maintenance expenses were cut to meet the reduction in business; but President Harrison says that owing to the "splendid responses to the emergency by officers and men charged with maintenance," the physical condition of the roadway and structures is better than it has ever been. Maintenance of way cost $8,452,000 in 1915, a decrease as compared with the previous year of $831,000, or 8.95 per cent.

Maintenance of equipment in 1915 cost $10,691,000, a decrease as compared with the previous year of $1,443,000, or 11.89 per cent. The only deferred maintenance, President Harrison says, is in repairs to freight cars.

The fact that only one passenger was killed in a train accident, and he was standing on the platform of a car is good evidence of the physical condition of the property.

As previously mentioned, $11,022,000 was spent for additions and betterments, of which $9,005,000 was for roadway and structures, and $2,017,000 for equipment. The largest items of expenditure for additions and betterments were for second track and line revision on the Danville division, $2,060,000, and on the Washington division, $1,676,000, and for new and enlarged yards, $1,890,000.

At the end of the year the company had $3,075,000 cash, $2,127,000 time deposits and $2,932,000 special deposits, comparing with $2,955,000 cash, $9,649,000 time deposits and $7,583,000 special deposits at the beginning of the year. Loans and bills payable remained unchanged, at $455,000.

The South has made remarkable progress both in agriculture and in manufacture in the last ten years and the sudden closing of the cotton markets of Europe to its principal cash product stopped this progress only temporarily. On the other hand, the low cotton prices of 1914 greatly stimulated a development which had been going on for some years looking toward more diversified agriculture in the South. The South may be expected in the future to provide the bulk of its own food supplies, with some surplus for sale. This will rob the possibility of a year of very low cotton prices of its worst terrors. As a matter of fact, agricultural conditions in the South this fall are extraordinarily good. The cotton crop is small, but prices are much higher than any one would have predicted six months ago and the left-over supply of last year's crop and this year's crop will apparently

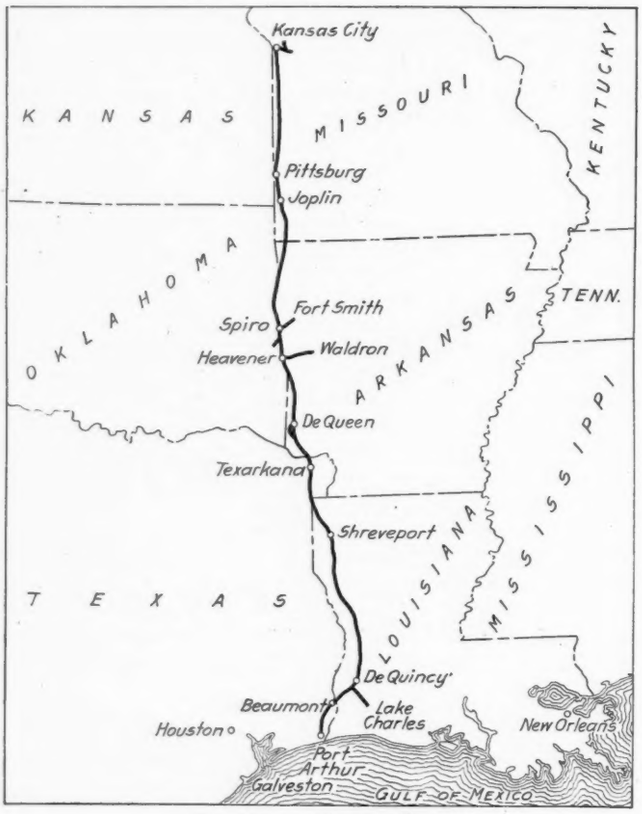
both be fairly well consumed, giving the planters a chance to start with a clean slate next year.

The following table shows the principal figures for operation in 1915, as compared with 1914:

	1915.	1914.
Average mileage operated	7,031	7,033
Freight revenue	$40,458,858	$45,632,207
Passenger revenue	16,175,674	19,016,099
Total operating revenues	62,199,510	70,750,997
Maint. of way and structures	8,452,119	9,283,239
Maintenance of equipment	10,691,267	12,133,829
Traffic expenses	2,110,467	2,244,351
Transportation expenses	22,757,597	25,713,747
Miscellaneous expenses	388,229	463,598
General expenses	2,019,621	1,987,879
Transp. for investment—Cr.	244,590	65,993
Total operating expenses	46,174,711	51,760,649
Taxes	2,595,828	2,679,390
Operating income	13,400,055	16,310,958
Gross income	16,638,972	19,578,364
Net income	1,656,682	4,839,706
Dividends	.....	2,700,000
Surplus	1,656,682	2,139,706

KANSAS CITY SOUTHERN

THE field forces of the Interstate Commerce Commission completed their surveys and inventories of the Kansas City Southern in April, 1915. The results of the valuation of the property have not been made public, but it is interesting to note that the total cost of federal valuation to date *to the company* has been $112,796. The present market price of the total outstanding securities would put a valuation of more than $71,000 per mile on the Kansas City Southern. The total par value of all



The Kansas City Southern

the securities outstanding would put a value of about $118,000 per mile on the property. The net operating income of the company in the fiscal year ended June 30, 1915, was $2,983,000. This would be 7 per cent on about $53,000 per mile.

Total operating revenues in 1915 amounted to $10,036,000, a decrease as compared with the previous year of $935,000. Total operating expenses amounted to $6,479,000, a decrease as compared with the previous year of $431,000. The Kansas City Southern is all main line and all single track, except for 18 miles of double track. The freight density (ton miles per mile of road) in 1915 was 1,451,000 tons, comparing with 1,377,000 tons in the previous year. Passenger density was 77,161 in 1915 and 88,684 in the previous year. The average ton mile rate in 1915 was 6.85 mills, and in 1914, 7.77 mills; the receipts per passenger per mile were 2.212 cents in 1915 and 2.311 cents in 1914. The total trainload of freight, including company freight, was 582 tons in 1915 and 545 tons in 1914. The falling off in revenue is ascribed by the management to a loss of $1,376,000 because of general business depression and disturbed conditions in the South resulting from the European war, and of $72,000 in express revenue caused principally by the extension of the parcels post. This was partially offset by an increase of $423,000 from abundant crops and conditions favoring export trade, $81,000 due to larger movement of asphalt from southern refineries and of black strap molasses for use in the manufacture of mixed stock feed, and increased revenue from the mails following reweighing.

Maintenance of way and structures cost $1,132,000, a decrease of about $12,000 as compared with the year before; but the actual decrease in the amount spent in maintenance of the property was about $61,000, the difference being caused by bookkeeping charges in accordance with the Interstate Commerce Commission's rules for amortization of abandoned property.

Maintenance of equipment expenses amounted to $1,185,000, a decrease of $167,000 as compared with the year before. This decrease, the management thinks, is due to a saving made because of the improved condition of equipment.

Transportation expenses amounted to $3,397,000, a saving as compared with the previous year of $274,000. This is in part due to the larger average trainload of freight and in part to savings in yard service, station service and to a reduction of $18,600 in payments for injuries to persons, etc.

Although freight revenue amounted to $7,731,000 in 1915, a decrease of $526,000, the total ton mileage of revenue freight was 1,129,000,000, an increase as compared with the previous year of 66,000,000 ton miles. The rate per ton mile of 6.85 mills in 1915, mentioned previously, compares with a rate per ton mile of 7.77 mills in 1914. The lower average rate is due to a smaller tonnage of high-class traffic and a large proportion of low class traffic. The saving in transportation expenses is especially noteworthy, because it was made despite the fact that the volume of freight business handled was greater in 1915 than in 1914.

The table shows the figures for operation in 1915 and 1914:

	1915	1914
Mileage operated	837	828
Freight revenue	$7,731,118	$8,257,449
Passenger revenue	1,410,618	1,675,168
Total operating revenues	10,035,896	10,970,403
Maintenance of way and structures	1,132,078	1,143,806
Maintenance of equipment	1,185,016	1,351,591
Traffic expenses	336,196	324,708
Transportation expenses	3,397,007	3,671,223
General expenses	489,009	418,992
Transportation for investment—Cr.	60,484	—
Total operating expenses	6,478,821	6,910,321
Taxes	574,316	567,857
Operating income	2,982,759	3,492,225
Gross income	3,143,678	3,689,639
Net income	1,140,431	1,725,449
Dividends	840,000	840,000
Surplus	300,431	885,449

NEW BOOKS

North Pacific Ports. Second edition. Bound in cloth; 421 pages; size, 5 in. by 7 in. Compiled and published by the Terminal Publishing Company, Inc., 802 Pacific Building, Seattle, Wash.

This is properly termed the Pacific shipping year book. It is a compilation of useful marine, exporting and importing information for Alaska and the western coasts of the United States and Canada and contains much data relative to the essential features of each of the Pacific ports from Nome to San Diego. There are given, for example, the harbor regulations, the charges for wharfage, pilotage, storage and other services assessed against a ship or cargo, information concerning the steamship lines plying from each of the ports, lists of docks and piers, etc. While the book is intended primarily for the ship owner, exporter or importer, railroad men desiring to become conversant with Pacific coast conditions will find in it much of value. The 1915 edition contains nearly 100 pages more than the first edition and has been otherwise improved.

Letters to the Editor

THE ACHIEVEMENTS OF THE STATE RAILWAY LINES OF GERMANY

London, Eng.

To the Editor of the Railway Age Gazette:

I read with not a little amusement in the *Railway Age Gazette* of September 3 Mr. Wile's story of "the amazing ability of the Kaiser's staff and field marshals to fling not only regiments, brigades and divisions, but entire army corps and even whole armies, from East to West, and back again from West to East, as emergency requires."

I am sure, as Mr. Wile says, that "many an American traffic manager," who knows what it is to move a mere 100,000 men without baggage to and from a baseball game, "will acknowledge that the job of switching a couple of million armed men, with full artillery equipment, back and forth incessantly, week in and week out through an area corresponding roughly to the states of Ohio, Michigan, Indiana, Iowa, Kentucky, Missouri, Wisconsin and Tennessee" will not only say that "represents as big a piece of 'railroading' as ever was tackled," but that it represents a piece of "railroading" that no man ever has tackled or will tackle!

Let us see what it would mean to do it. An army corps of 40,000 men with its complement of horses, guns, ammunition, baggage, ambulances, field kitchens, etc., requires, according to English reckoning, 160 trains. We are, of course, accustomed to short trains moved at high speed, and we give our men much more room than continental armies are allowed. As nearly as I can make out, the French railways, which have published very full statistics, have moved on the average more like 300 to 350 men in a train. Let us assume the maximum that the Germans could move to be 500; then an army corps would require 80 trains; a couple of million men—that is fifty army corps—would require 4,000 trains. Now what is the capacity of a railway? The French mobilization scheme on the main lines allowed for a train every 10 minutes for 66 hours out of 72. And I think no practical railway man would undertake more than this. This means a capacity of 200,000 men in three days. And to do this implied the command of at least four first-class stations, amply equipped with siding accommodation, loading appliances, coal supplies, etc., at the forwarding end, and similar accommodation at the receiving end. The French did it in their own country according to a prepared scheme. Can anybody imagine that the Germans could do as much on an improvised scheme, with the broken down railroads of Belgium at one end and the broken down and mainly single-track lines of Poland and Galicia at the other? How many distinct routes the Germans had available I cannot say. But it is clear that they would have needed at least 10 first-class double lines, cleared—not lines only, but stations as well—of all other traffic of any kind whatsoever. Where the Germans got the vehicles to hold a couple of million men or the engines to haul them, where they side-tracked them for the three days before the return journey began, I know not; and Mr. Wile does not tell us.

So much for possibilities; now for actualities. The French and Russian general staffs—whose business it is to know from prisoners' regimental badges and other information available what troops are in front of them—have never suggested that there have been any great movements of German troops from the one frontier to the other. I have inquired from the two men in this country probably most competent to answer what is their impression. The answers were private, so I am not at liberty to give my informants' names. The one writes: "Mr. Wile's statement is, of course, an absurd exaggeration. . . . When the necessity arose for strengthening the Germans in the East, various army corps were from time to time moved east from the West, but the movement was never very large, and the greatest transfer appears to have taken place during the last three months, when about nine divisions (190,000 men) were transferred in this manner." My other correspondent writes: "The statement is quite ridiculous. The most that have ever been moved from West to East has been a corps at a time, if that, and it took anything from a week to 10 days."

I think when the history of the war comes to be written these two statements will be found somewhat nearer the truth than Mr. Wile's fantastic tale of "switching a couple of millions week in and week out" from one front to the other. It is worth noticing that the official statement of the German general staff, which Mr. Wile translates, deals entirely with generalities. It is not unusual for Germans to survey their work and to find it very good. But it would have been more interesting to outside observers, had they copied the example of the French, and given us precise figures of what they did actually accomplish.

One of my correspondents says: "The largest operation of the sort in the war so far was the transport of three whole army corps from the Aisne to Flanders"—not 800 to 1,000 miles, but, say, 150—"in one week by the French railways nearly a year ago."

W. M. Acworth.

FIGHTING SHY OF A HARD JOB

Richmond, Va.

To the Editor of the Railway Age Gazette:

One hears much discussion among railway men as to whether the valuation of railways is to be based on "original cost to date," or on "cost of reproduction new," as if there were to be a choice between the two methods. I have noticed that railway men are almost a unit in favor of "reproduction new." This is where they are making a mistake. From the standpoint of the clerks, who are supposed to do this work, there is reason to fight "original cost," for it is a heartbreaking task to dig it out on account of the way most of the records have been kept. But from the standpoint of the owners, or stockholders, the roads should insist on original cost as a basis of valuation, instead of fighting it. Many of the railroads in this country can be reproduced new for 50 per cent of what they cost originally, and if the roads themselves do not dig up this original cost, who is going to do it? Who has any interest in doing it except the owners?

When Congress had the valuation bill before it, many reasons were given for its passage. Two of these were, as a basis for making rates and as a basis for government purchase. For both these purposes it seems to me self-evident that the owners of the property are vitally interested in having the first cost price considered in placing a legal value on their property, which will run from 20 per cent to 50 per cent higher than any cost that can be estimated for reproduction new. The fact is that the higher officers of the railways, as a rule, have not found time to give the matter their personal study. It has been observed that they all shy at it, and turn it over to subordinates. It sifts down to where the accounting officer details several clerks, whom he can most readily spare, to "work it up." Those clerks feel that they have a snap, and without much study of what they are to do and no particular interest fire away on some item, say buildings, to find the original cost. They immediately bump into a stone wall, or what feels like one. The records are not in shape to pick this up readily. It requires intelligent and patient effort and experience with building matters, so the clerks immediately raise a cry that it cannot be done, no records, etc. They tell the chief clerk it cannot be done; he tells his superior and so on, back to the commission, until the commission seems now inclined to believe that original cost to date must be abandoned to a large extent and estimated cost of reproduction depended upon.

The writer has assisted several roads in this work and has had long service in construction accounting, and is therefore

entitled to an opinion. I do not know of anyone who has looked up more of those things than I have, and I will say that I have never found anything yet that the cost could not be found in some way, if the records have not been destroyed, which is not the case in 99 per cent of the roads. The records are generally well preserved, but are crude and scattered, and it requires work to unravel them. Can the railways afford not to do it at any cost of labor? The cost of reproduction new must be estimated, of course. This is up to the commission, but the original cost is the job of the owners of the property. It is not a question of which method shall be used, as many seem to think; both methods must necessarily be used to arrive at a just valuation, which lies somewhere between the two. The only hope of the carriers to get the value they are entitled to is by presenting data showing their original cost to date.

A. P. T.

COLD STRAIGHTENING OF RAILS

Chicago

To the Editor of the Railway Age Gazette:

The cold straightening of iron rails was originally accomplished by the use of a 40-lb. sledge wielded, as I remember it, by a stalwart Welshman, and the picture of his slinging the sledge, as well as that of his subsequent refreshment from bread and cheese and a jug of ale, is very clear in my memory. As the size of the rail sections and output of the mills were increased, mechanical means of straightening became necessary, and the rail-straightening press was invented. The first ones were of the crocodile type copied from the squeezers used to press the balls of puddled iron into blooms, later changed to a machine with a straight plunger driven eccentrically, and, except for increased weight and power, it is to-day about the same machine, continuing to transmit the force of its blows to the rail through a wedge-shaped gag.

The early hot-straightening was an operation involving heavy and hot labor; the camber or sweep being given to the rails by manually placing them head up on curved plates and hammering them into place with wooden mauls. This involved turning the curved rail over onto the hot bed, by seizing it at each end with tongs, and there was always the danger of putting a twist in it while so doing. The rails were pushed along the hot beds by hand power, and care was subsequently exercised by turning them at various stages of their cooling. This all required time and severe and exhausting labor. The situation brought the revolutionary invention of A. J. Gustin, embracing an automatic curving or cambering machine and mechanical means of sliding the rails along the hot beds. The Gustin device was improved upon and gradually superseded by the cambering machine designed by William Clark, and all later mills have been equipped on those lines.

The objections to gagging steel rails during the operation of cold straightening them have long been recognized, and generally appreciated by engineers familiar with the details of rail making; but, while a number of efforts have been made to perform cold straightening through some other means, the rail press and its brutal gagging still hold the field in all countries where steel rails are manufactured. To obtain the desired results, the rail has to receive blows which shall send the metal beyond its elastic limit, and as frequently a rail will receive a number of such blows, it is easy to understand the cause of many otherwise mysterious breakages of rails in service, and I am confident that most of the dreaded and somewhat mysterious transverse fissures had their origin during the cold straightening operation.

The writer, by written articles and earnest speech, has for years called attention to the dangers incident to the cold straightening of rails by gagging, and I early introduced into rail specifications demands for the reduction of gagging to a minimum through more careful treatment of the rails during the hot straightening process, and undoubtedly much good has been accomplished through such provisions. As the weight and speed of rolling stock have increased, railway track construction and maintenance have progressed, and thus the requirements for straight line and surface of the rails have also grown, and unless this was met by more careful work on the hot beds, the cold gagging was certain to be more severe.

In the designing of practically all of the more recent rail sections it has been sought to have the metal so distributed that undue stresses shall not be developed during any part of their making, and much good has been accomplished. Just at present the question as to the practicability of increasing the standard length of rails beyond 33 ft. is being seriously considered by railway engineers, and many of them realize that such increase will add to the straightening troubles. If the length is materially increased, it will necessitate alterations in the hot bed equipment of most, if not all, of the rail mills, as well as some alterations in the locations of their cold straightening presses, drill presses, etc., and will be liable to augment the cold straightening troubles and, therefore, I think it would now be well to consider the desirability and practicability of adopting radically new straightening requirements. I feel confident that with careful and skilful manipulation of the rail cambering machines, and carefully constructed and ample and well protected hot beds, about all of the current sectioned rails can be so manipulated that they will require but little if any cold gagging. Indeed, I believe that in a short time the cold press could be almost if not entirely eliminated; but this would require a willingness on the part of the railway engineers to accept rails which would not be absolutely straight, so far as having sweeps in either their line or surface or both. Such sweeps need not be so great but that with present track laying methods the rails could be spiked straight when laid, and thus the danger of incipient or actual ruptures from cold gagging be eliminated. Of course, to begin with kinks would have to be gagged out, but I think that, as a principle, rails with kinks should be rejected, and, if so, that penalty would soon lead to their non-production. It would be a radical departure, and, in my judgment, should be introduced in a conservative manner, letting the progressive steps be taken as they become justified by experience, and I am confident that many if not all rail makers would welcome such an innovation—shall I say progress—and that in a short time we would be getting satisfactory results.

Robert W. Hunt.

WITH RAILROADS IT'S DIFFERENT

By Francis W. Lane

If in European travel you should meet death by a shell, or a German submarine blow up your boat, there is glory in the story which your friends will love to tell, and for you it doesn't matter; you're the goat. When a juggernautomobile knocks you down upon the street—whether you or it's the one that didn't stop—on the whole, it is a trifle, even though the wreck's complete and your remnants are collected by a cop. But with railroads it is different. If, perchance, a flying train strews anatomy of yours along the track, there is only one thing certain, it will not occur again; but your ghost is almost sure to wander back. You stroll along the roadway and flip the moving car, and, to duck the con, you sit upon the step; you don't appear to figure you've no business where you are and, unless you're pinched for trespass, don't get hep. When you travel, merest trifles set aquiver every nerve; if you pinch your little finger in the door, or you lose your equilibrium in scooting round a curve, you will damn that measly road forevermore. You will charge the grossest crime, negligence in operation, even though you had no business to be there; curse the managing officials, fill the air with lamentation, and cavort around and rip and tear your hair. In Europe they are killing men by thousands every day; over here we drown a shipload at a dock; our juggernautomobiles mostly kill what's in their way; but it takes a jolt by rail to give a shock!

Annual Meeting of Railway Real Estate Association

New Organization Holds Its First Convention at Chicago for Discussion of Land and Tax Matters

The first annual meeting of the Railway Real Estate Association, whose recent organization was reported in the *Railway Age Gazette* of June 11, page 1256, was held at the Hotel La Salle, Chicago, on October 13 and 14. The membership of the association is now 79, of which over half were in attendance at the first meeting. President F. P. Crandon, tax commissioner of the Chicago & North Western, presided, and after brief addresses by the officers and other preliminary business the program was devoted principally to the reading and discussion of papers.

W. W. Baldwin, vice-president of the Chicago, Burlington & Quincy, addressed the meeting on the subject of recently proposed changes in the tax laws of Illinois, and changes in the constitution of the state as applied to taxation, which he said would strike out every clause requiring uniformity as to methods of taxation based on a valuation of the property, in order to exempt certain classes of property from taxation and to place the entire burden on other classes. This, he said, would undoubtedly increase the taxes paid by large corporations, including the railroads, and the effect would be very apparent when the state enters upon a plan of heavy expenditures for road improvements.

VALUATION OF RAILWAY LAND

William A. Cokeley, right of way and claim agent of the New York, Westchester & Boston, read a paper on "Valuation of Railway Land," of which the following is an abstract:

In the examinations being made by the Interstate Commerce Commission, relative to the valuation of railroads, the land appraisers engaged in the work, having access to books, data, etc., both public and private, have brought to light many instances of land valuations of specific parcels, widely divergent in amounts. How this condition was brought about can only be conjectured, but it will prove mighty embarrassing, in the event of litigation, if the valuation of the property in question, as offered in evidence by the railroad, happens to differ materially in amount from that placed upon it by the land appraisers.

A likely explanation is that different valuations were made by employees. It is known that in many instances, attorneys have aided directors in making a good showing by appreciating land values, in order to justify the issuance and sale of bonds. Attempts also have been made, successfully at times, to beat tax valuations and assessments by similar tactics, and values have been enhanced or reduced as the exigency demanded.

Fortunately the day of the expert retained from time to time, in order to appreciate or depreciate the value of the land holdings of a railroad is over. The new order of affairs, relative to regulation of business corporations, has lessened the desire to adhere to such methods and they have been practically eliminated.

If we have not adjusted ourselves to this new order, how can we? By conducting the affairs of the real estate department as carefully, methodically and scientifically as the engineering department is conducted.

By this I do not mean that appraisals or values of land can be made by formula, but our methods must be just as illuminating as the computations of the engineers. How many of us can furnish a description showing the physical character of the parcels that go to make up the holdings of the property under our charge? How many can show, by any record at their command, just what prompted and justified them in valuing a piece of property at a greater amount than was paid for it? If our system is not elastic enough to permit us to establish and keep such a record, then we should immediately institute a reform and devise a form which will accomplish the desired result. After a form has been devised an inspection of the physical character of the entire property, parcel by parcel, should be in order—a mental photograph formed and notes made. A reconnaissance of adjoining or adjacent property should also be made and notes taken in the same manner. Then we are equipped to accurately describe any parcel of land, giving its character, its influence on neighboring property and also indicating what influence neighboring property has on it. Such a description is absolutely essential where appreciation of value is shown over cost value.

It may be said that many roads have just such records. Fortunate are those that have anticipated this requisite. There is nothing that will convince the land appraisers of the merit of your valuations more quickly than preparedness by proper records.

There will be much litigation between the government and the railroads before it will be definitely settled just what land values will be allowed. It is because of possible litigation that I advise making up a complete history of each parcel, containing much that is not included in the form furnished by the commission.

It must be remembered that the land appraisers are human and subject to all the frailties of human kind. Some are competent and fair. Some are competent and biased. Some lack judgment and many lack perspicacity. It therefore behooves us to be in such a position, come as they may, as to establish our values beyond dispute. They must have more than a semblance of fairness. They must be backed by reasons that will justify our judgment and be convincing beyond cavil.

While the land appraisers may not have had the experience the right-of-way or railroad real estate agent may have had, it must not be forgotten that their appraisals will stand unless we can offset them in court. We must be prepared to furnish our attorneys with facts that will completely confute the contentions of their opponents and upset the appraisals made by the government. So be prepared.

The discussion on Mr. Cokeley's paper was opened by E. A. Whitman, valuation engineer, Minneapolis, St. Paul & Sault Ste. Marie.

COSTS OF REAL ESTATE

E. Holbrook, special engineer, Union Pacific and Southern Pacific systems, gave an informal address on "Compositions of Cost of Railway Estate," in which he urged the importance of making every effort to get at the composition of cost of right-of-way and terminal grounds on account of the necessity for proving these costs in connection with the valuation now being made by the Interstate Commerce Commission. In illustrating the importance of the subject he called attention to the fact that the railways in the United States own about $5,000,000,000 worth of land, which is the largest item of property they have, constituting about one-third of the total. He discussed the relation of cost to values, and described the results of numerous investigations showing the large proportion of expense entering into the acquirement of railway land, in addition to the bare cost of the property, which can only be discovered in many cases by extensive research, while there are many such items of cost which cannot be traced now. Mr. Holbrook expressed the opinion that such obscure items will usually run from 10 to 15 per cent of the cost of land as shown by the vouchers.

He also outlined an interesting calculation he had made with reference to the unearned increment argument, to show the effect of railway location on the value of adjacent land. He had taken the assessed value of all property within 10 miles of a railroad for a distance of 40 miles, in a territory in which

there was no other road sufficiently near to influence the value of the land, and had computed the value of the entire property with relation to the value of the outside property. He found that in a total valuation of $15,000,000 the excess value of the entire property as compared with the value of the property at the outside edges, was $3,250,000, or more than what the entire railroad through the property cost. He also gave some interesting figures as to an investigation of the cost of property acquired by the railroads for the Kansas City terminal. His investigation had not been completed, but at the time of the investigation the railroads had spent $10,500,000 for land, which represented 3.09 times its normal market value, and that other items which he had been able to locate, including a large amount of land donated to the city for a park, brought the total cost of land up to approximately $14,000,000. The first land for the terminal was purchased in 1902, and the rest from 1906 on. He had figured the interest on each piece of land from the date of its purchase to November 1, 1914, when the terminal was opened, and it amounted to 31 per cent of the cost of the land, or about equal to its normal value. Eliminating the value of the land donated to the city the railroad received only about $2,000,000 worth of property, figured at its normal market price.

Mr. Holbrook said that some railroads had ordered their land departments not to anticipate any expense on account of the valuation, and therefore that some of them had not done the work necessary to get their records in proper shape. He urged the members of the association to do everything in their power to induce their roads to begin the work of investigating the cost of their land, and to make every possible search for records of this kind, as it is work that requires a long time and can never be made complete. And in the future railroads should never buy a piece of land without making complete records of all items of cost connected with the purchase.

LEASING OF RAILWAY PROPERTY

Frank Taylor, right-of-way and lease agent of the Canadian Pacific, read a paper on "Leasing of Railway Property for Industrial Purposes," in which he said in part:

The promiscuous granting of sites on railway property at nominal rents, for shipping warehouses, etc., by local officers, a custom which prevailed pretty generally not many years ago, seems now, like many other old railway customs, to be yielding to the ever-widening demand for uniformity in practice, and for executive control by means of standard methods. While, however, some railways have a well-defined policy, and clearly-drawn instructions governing the handling of all such leases, on other railways we find either no general policy at all, or an indefinite one, subject to change to meet any and all conditions demanded by shippers who are looking for sites.

What we should first endeavor to accomplish is, the adoption of a schedule of rents bearing a fixed ratio to the value of property, and then undertake to adhere absolutely to such a schedule. Many railways have a schedule of rents and apply it in probably the majority of leases, but the exceptions are sometimes so numerous as to materially affect the revenue from this source, and to discourage effort to maintain the standard.

The principal obstacles to the rigid observance of a schedule are first, the precedent established years ago of granting leases at nominal rents, many of which leases are still in force, and second, the conditions arising at competitive points, due to lack of agreement between railways. With regard to old leases at nominal rents, the argument usually advanced when there is any talk of geting them up to schedule, is that lessees erected their warehouses under such leases, believing that the company did not seek revenue from this source, and that it now would be tantamount to a breach of good faith for them to charge a rent proportionate to the value of the site, and this is usually followed by a guarded intimation that a change in the rent would result in the removal of warehouse and loss of traffic to the railway, and finally a "spiel" about what good friends they have been to the company all these years, and so on.

Then the freight traffic officer, for he usually gets into the deal about this stage, verifies the touching story of fidelity and affection, and between him and the operating department officials, the lease agent is finally routed with a mortifying conviction that he was caught in the act of stealing candy from a baby, and that he didn't even get away with the candy.

We are sometimes reminded that in our zeal for our special work, our horizon is too apt to become limited to the departmental scope, that the obtaining, handling and retaining of freight business is the major function of a railway company, and that where it is involved the question of rent for industrial sites must be relegated to its proper and insignificant niche.

This is a sort of a cold douche, but rather than get disgruntled about it, and seek solace in the reflection that a freight man would give away the whole road for a carload of competitive freight, it would be better to face the situation. The freight man is right about the relative importance of freight traffic, but it is just possible that he may have a departmental note in his own eye. The sources of revenue on the big transportation companies of our day are very varied, and not one of them in these days of competitive and legislative burdens can with prudence be ignored. If the industrial site is a handmaiden of the freight business, and can also be utilized as one of the sources of direct revenue without detriment to traffic returns, there can be no question regarding the wisdom of benefitting by it.

Until the old leases are brought up to the general schedule there will always be difficulty in getting new applicants to accept it, and this difficulty is greatly increased, when for traffic considerations exceptions to schedule rates in new leases are made in favor of certain shippers, or at competitive points. This latter condition can only be remedied by an agreement between railway companies.

Mr. Taylor then outlined the methods used by the Canadian Pacific. The paper was discussed by W. S. Bake, land and tax agent, Pere Marquette.

RAILWAY TAXATION

J. B. Jones, tax agent of the Louisville & Nashville, read a paper entitled, "Is Railway Taxation Approaching the Limit?" in which he outlined the methods of railway taxation in Alabama and Florida. He estimated that in Alabama the railroads pay, in state, county and municipal taxes and licenses, substantially more than one-sixth of their net operating revenues in the state; in other words, it takes over two months' earnings to pay the taxes, and that the assessed valuation of railroad property constitutes about 16 per cent of the aggregate assessed valuation of all property in the state. As to the rates of ad valorem taxation, he said, the constitutional limits of taxation have been generally reached, but the state apparently has not yet reached the limit of its power as to license taxes. In Florida the railroads pay about 15 per cent of the ad valorem state taxes, but probably a considerably larger proportion of local taxes. Discussing the general situation Mr. Jones showed that the taxes paid by the railroads of the United States per mile amounted in 1900 to $255, in 1907 to $367 and in 1915 to $586, or about 16 per cent of the net operating revenues, but that there is an encouraging sign in the reduction from $604 per mile in 1914.

OTHER PAPERS

Other papers were presented as follows:

"Subsidy Lands and Office Records," by B. A. McAllaster, land commissioner, Southern Pacific. Discussion opened by John A. Dresser, until recently manager lands department, Algoma Central & Hudson Bay.

"Real Estate Features in Connection with Separation of Grade Crossings," by H. A. Howarth, real estate agent, Long Island Railroad. Discussion opened by E. E. Pettibone, real estate agent, New York Central Lines west of Buffalo.

"Uniform Contracts Covering the Occupation of Railway Lands," by H. H. Trabue, assistant chief engineer and assistant real estate agent, Nashville, Chattanooga & St. Louis. Discussion opened by C. H. Moran, assistant real estate agent, Baltimore & Ohio.

"Acquirement of Right-of-Way Land and the Preparation of Deeds Therefor," by Peter K. Soffel, real estate claim and tax agent, Wabash-Pittsburgh Terminal, and Wheeling & Lake Erie. Discussion opened by J. W. Marvin, right-of-way and tax agent, Duluth & Iron Range.

Pierce Butler, valuation counsel, Western Group Presidents' Conference Committee on Valuation, addressed the meeting on some features in connection with the valuation of railway land.

It was decided that the president should appoint committees for the ensuing year, as follows: A standing committee of five on standard forms for leases, a committee of five to investigate and report as information on methods of keeping office records and accounts, a committee of three to examine the constitution and by-laws with a view to their revision, and a membership council. It was also decided to extend an invitation to the Railway Tax Association to amalgamate with the Railway Real Estate Assocation. Officers for the ensuing year were elected as follows: President, B. A. McAllaster, land commissioner, Southern Pacific Company, San Francisco; first vice-president, James P. Nelson, valuation engineer, Chesapeake & Ohio, Richmond, Va.; second vice-president, Frank Taylor, right-of-way and lease agent, Canadian Pacific, Montreal, Que.; secretary, F. C. Irvine, special agent, Pennsylvania Lines, Pittsburgh, Pa.; treasurer, J. G. Armstrong, assistant real estate agent, Wabash-Pittsburgh Terminal and West Side Belt, Pittsburgh, Pa.; board of directors: F. A. Walter, general right-of-way and tax agent, San Pedro, Los Angeles & Salt Lake, Los Angeles, Cal.; H. D. Howe, general land and tax agent, New York Central Lines West, Chicago, Ill.

It was decided to hold the 1916 annual meeting in Chicago.

EFFECT OF RECENT FLOODS ON RAILWAYS

The public seldom realizes the extent to which the ordinary difficulties of railroad operation are frequently increased by extraordinary occurrences, such as floods and storms, nor the great pressure of emergency work suddenly thrust upon a railroad organization by the necessity of immediately repairing the damage thus caused in order to restore service as speedily as possible.

The great floods which put large sections of the railroads in Ohio, Indiana and Pennsylvania out of commission for considerable periods in the spring of 1913, causing damage which was estimated to have cost the railroads in Ohio alone approximately $10,000,000, naturally attracted widespread attention, but the effects of more localized catastrophes, such as the floods at Galveston, Tex., and in the vicinity of St. Louis, Mo., which were described in the *Railway Age Gazette* of August 27, page 393, and the recent storm in the vicinity of New Orleans, La., are often scarcely appreciated outside of the territory involved.

One of the accompanying pages of illustrations showing some of the effects of the hurricane of August 16 on the property and equipment of the Sunset-Central Lines in the vicinity of Galveston, gives an idea of the unusual difficulties experienced by the railroads on such occasions. The losses of the Sunset-Central Lines on account of this storm were conservatively estimated at $375,000.

Another page of illustrations presented herewith shows some of the effects on the railroads of the recent hurricane which passed over New Orleans and vicinity on September 29, causing the deaths of about 300 persons, and damage to property which has been roughly estimated at over $1,000,000, a large proportion of which was railroad property.

A hurricane from the Gulf of Mexico struck New Orleans about 8:00 a. m., on the date mentioned, gaining in violence during the day until between 4:30 and 7:30 p. m., the wind attained a velocity of from 80 to 120 miles an hour. The barometer fell to 28.11 in., said to be the lowest ever recorded in the United States. In addition to the damage to buildings in the city of New Orleans the country for many miles was devastated and railroads entering the city from every direction suffered damage as well as interruptions to their service.

The most serious consequences of the storm, as far as loss of both life and property is concerned, were the results of the flood. Besides bringing heavy rains the storm backed up the waters of Lake Pontchartrain, north of New Orleans and connecting with the Gulf of Mexico, forming a tidal wave nearly 12 ft. in height when it struck the western shore of the lake, and overflowing the low-lying surrounding country for miles. The line of the Louisville & Nashville, which crosses an arm of the gulf over a long bridge at Rigolets at the lower extremity of the lake was cut in two when several of the girder spans were washed away, in addition to damage done at many other places on the line between New Orleans and Ocean Springs, Miss.

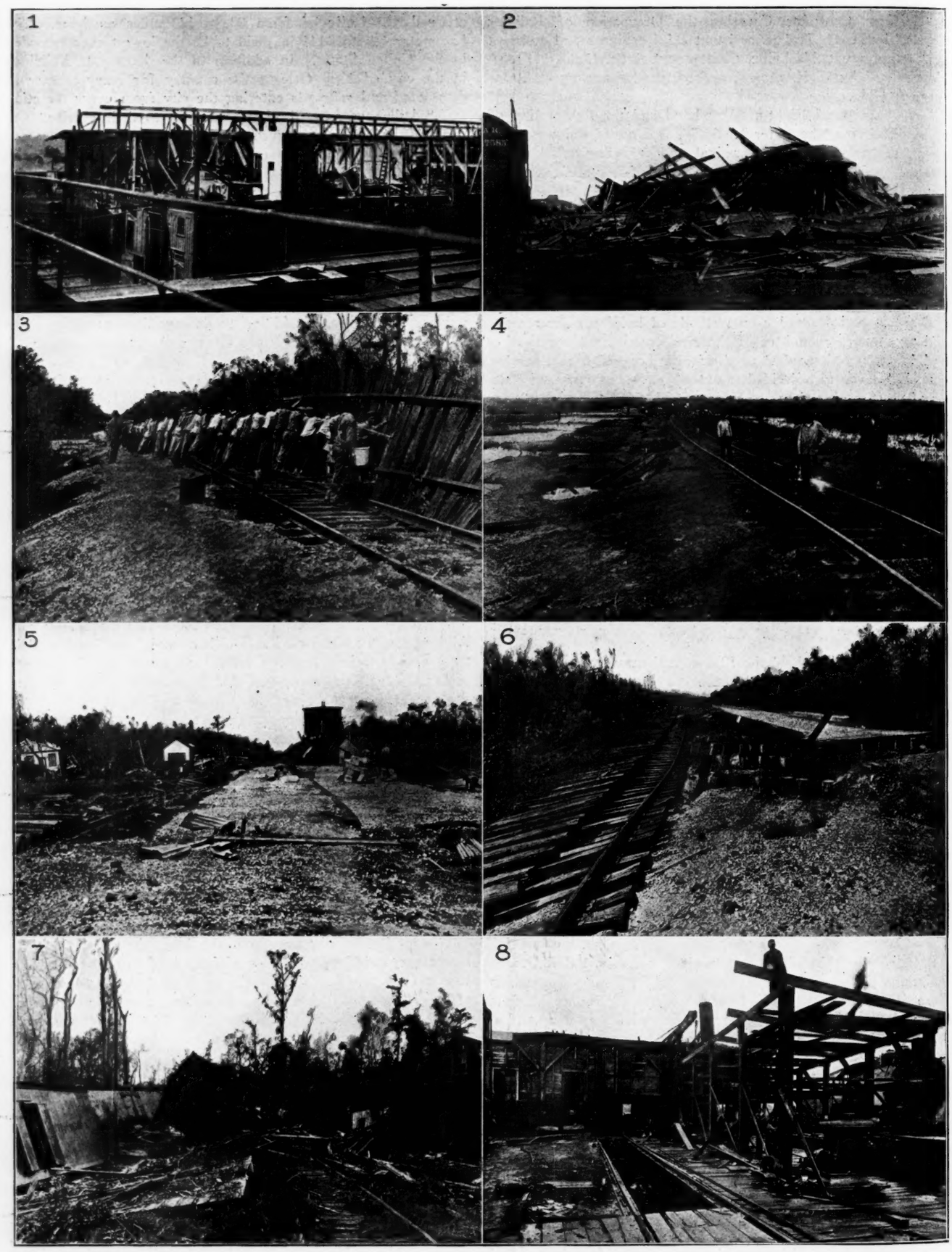
The Illinois Central main line to New Orleans extends along the western shore of the lake for several miles, crossing a narrow channel between Lake Pontchartrain and Lake Maurepas, and between New Orleans and Hammond 18 miles of double track was washed from the embankment, most of it between Kenner and Ruddock. Although cutting the main line, the storm did not interfere with the Illinois Central's through service, because the line of its controlled road, the Yazoo & Mississippi Valley, entering New Orleans from the west from Baton Rouge, was not damaged and trains were detoured over this line, and from Baton Rouge to Hammond. A single track was restored through the flooded part of the main line on October 8.

The property loss of the Sunset-Central Lines is estimated at $150,000, consisting principally of damages to shop buildings in Algiers, La., the sinking of several barges and car floats used in transferring freight between New Orleans and Algiers, roofs and walls of freight houses and warehouses damaged, and damages to ferry inclines on the New Orleans side of the Mississippi river. Aside from obstructions caused by fallen telegraph poles, signal posts and trees, the line into New Orleans was not interrupted and trains leaving there the day following the storm reached Houston, Tex., practically on time. None of the destruction was of such a nature as to interfere with the prompt handling of business and repairs were rapidly under way. The views reproduced herewith were taken on the Sunset-Central Lines and on the Illinois Central.

In the case of the latter road it will be noted that much of the track was washed to a considerable distance from the embankment. In other places one track was turned completely over onto the other track. Although most of the line is located at a considerable distance from the lake, the water in some places overflowed several miles of farm land to a depth of four to six feet on either side of the track, and the flood came so suddenly that at Frenier, La., 25 section men were drowned before they could escape. Roadmaster R. L. Hazlegrove and Peter Elardo, a section foreman, were drowned in the section house at Manchac.

Aside from the damage to the track the Illinois Central's property loss was estimated at $30,000. This included the loss of the station at Manchac, damage to docks and several roofs, including that of the roadhouse at Harahan, La. There was comparatively little damage to the company's property in New Orleans. Over 14,000 lineal feet of bridge work in 67 double track bridges was damaged. About half of the decks were washed away, but most of the material was recoverable and the piling and caps were left intact. On the Yazoo & Mississippi Valley the only damage was to telegraph and signal wires and poles.

The storm subsided about 9 o'clock in the evening and much of the water flowed into the lake, making it possible to begin rebuilding operations at once on the following day. On the Illinois Central repair gangs were promptly organized and sent



1) and (2) Sunset-Central Lines Car Shop and Paint Shop at Algiers, La. (3) and (4) Illinois Central Main Line Between Manchac and Hammond After Repair Work was Begun. (5) Pump Station and Tank at La Branch, La., Where Several Houses were Washed Away. (6) Showing Track Washed off Trestle and Turned Upside Down. (7) Showing Cars Washed off Track. (8) Government Yard Roundhouse After the Flood

(1) British S. S. Ribston, 330 Feet Long, Aground on G. H. & S. A. Side Tracks. (2) Overturned Interurban Cars on Damaged Causeway, Looking Toward Galveston Island (3) Scene in G. H. & S. A. Yards, Galveston Island. (4) Debris on Island near Entrance to Causeway. (5) Arched Portion of Causeway, Looking Toward Mainland. (6) Signal Tower at Entrance to Causeway, Mainland. (7) Corner of Southern Pacific Wharf, Galveston Island. (8) Virginia Point on G. H. & S. A. Tracks

to the scene of the washouts in motor boats, working from both ends of the washed out portion of the track. About 1,000 men were employed on the work in the day time and 600 at night. Much of the track it was possible to pick up and relay on the embankment intact, and much of the timber was recovered. Derricks and new materials required were brought in as fast as a track could be laid, while to some places material was brought in by boats, which were also used by the supervising officers. The president, vice-president in charge of the operation, general manager, chief engineer and other officers were on the scene as early as possible.

The railroad forces also were able to do a great deal of relief work in rescuing people who had been obliged to take refuge in trees. The extent to which railroad service was interfered with is indicated by the experience of a man who to get from Gulfport, Miss., to New Orleans, a distance of about 60 miles, on the Sunday following the storm, found it necessary to travel 360 miles by way of Jackson, Miss., and Baton Rouge, La., to get to his destination.

TRAIN ACCIDENTS IN SEPTEMBER*

The following is a list of the most notable train accidents that occurred on railways of the United States in the month of September, 1915:

COLLISIONS

Date	Road	Place	Kind of Accident	Kind of Train	Killed	Injured
1	Chicago, M. & St. P.	Racine	bc	F. & F.	1	0
1	Missouri, K. & T.	Smithville	bc	F. & F.	2	1
8	Denver & R. G.	Tennessee Pass	bc	P. & F.	1	64
24	Missouri Pac.	La Platte	bc	P. & F.	3	4
25	Balt. & Ohio	Willow	rc	F. & F.	1	2

DERAILMENTS

Date	Road	Place	Cause of Derailment	Kind of Train	Killed	Injured
4	San Pedro, L. A.	Galt, Nev.	Washout	P	0	3
4	Norfolk & W.	Starkey	Slide	F	4	4
5	Balt. & Ohio	Confluence	D. truck	P	0	13
10	Chicago & A.	Elwood	Unx	P	0	7
14	Wrightsville & T.	Alcorns, Ga.	Cow	P	1	1
18	Balt. & Ohio	Ripley, W. Va.	See below	F	0	9
20	C. B. & Quincy	W. Springs, Ill.	D. truck	F	1	16
23	Penn	Titusville	B. wheel	F	1	0
28	New York Central	Bryan, Ohio		F	1	1
30	Penn	Lancaster	Unx	F	1	3

The trains in collision at Racine, Wis., on the first, were an eastbound and a westbound freight, both running at moderate speed. Two engines and one car were badly damaged. The engineman of the eastbound train was killed. The collision was due to disregard of a meeting order by the men in charge of the eastbound train. The engineman forgot the order and the conductor started from the appointed meeting place on the assumption that the westbound had arrived.

The butting collision near Smithville, Tex., on the first, was between two heavy freight trains, both running at good speed; and ten cars were wrecked. The engineman and fireman of the northbound train were killed and a brakeman was slightly injured. The collision was due to neglect of the men in charge of the northbound train, who overlooked a despatcher's order.

The trains in collision near Tennessee Pass, Colo., on the eighth, were eastbound passenger No. 20 and a westbound extra train, consisting of a light engine. Both engines were damaged. One fireman was killed and 11 employees and 53 passengers were injured, most of the injuries being slight. The collision was due to the negligence of the men in charge of the light engine.

The trains in collision near La Platte, Neb., on the morning of the 24th, were southbound passenger No. 104 and northbound freight No. 153, both running at good speed. Three trainmen were killed and four were injured. The passengers escaped with minor injuries. The collision was due to forgetfulness on the part of the men in charge of the passenger train, who overlooked a despatchers' order and a caution card and ran past the appointed meeting place—a non-telegraph station.

The trains in collision near Willow, Ohio, on the 25th, were both work trains, one running into the rear of the other, because the leading train was not properly protected by flag. One employee was killed, and seven others were slightly injured.

The train derailed near Galt, Nev., on the fourth, was a westbound express. Three passengers were injured. The cause of the derailment was a washout, due to a cloudburst.

The train derailed near Starkey, Va., on the fourth, was a southbound freight and the engine and five cars were wrecked. Two trainmen and two trespassers were killed and four trespassers were injured. The derailment was due to a landslide which struck the engine, sidewise, at the moment it reached the point.

The train derailed near Confluence, Va., on the fifth, was an excursion passenger train and two employees and 11 passengers were injured. The cause of the derailment was a defective engine truck.

The train derailed near Ellwood, Ill., on the evening of the 10th, was southbound passenger No. 9, and one coach was partly overturned. Seven passengers were slightly injured. The tender was the first vehicle to leave the track; cause not discovered.

The train derailed at Alcorns, Ga., on the 14th, was a passenger train No. 2 and the engine was overturned. The engineman was killed and the fireman injured. The derailment was caused by a cow, which ran upon the track immediately ahead of the train while it was moving at low speed.

The train derailed near Ripley, W. Va., on the 18th, was a wrecking train consisting of an engine and four cars, and the cause of the trouble was a loose wrecking crane which swung crosswise of the track and knocked down one truss of a bridge. The engine passed over the bridge in safety, but the cars fell to the bed of the creek 50 ft. below the track. Nine employees were injured.

The train derailed at Western Springs on the 20th was an eastbound freight and a derailed car fell in front of westbound passenger No. 55, which was running about 40 miles an hour. It overturned the engine. Fourteen passengers and two trainmen were injured, one of the trainmen fatally. The cause of the derailment was a brakebeam which became loose and fell to the track.

The train derailed near Titusville, Pa., on the night of the 23rd, was a fast freight and 17 cars were wrecked. One brakeman was killed. The derailment was due to the breaking of a wheel.

The accident at Bryan, Ohio, on the 28th, was the derailment of a work train, the tender of the locomotive being the first vehicle to jump the track. The fireman was killed and the engineman injured.

The train derailed at Lancaster, Pa., on the 30th, was a local freight, and the cause of the derailment was an open switch. One car was knocked off a trestle in the yard, and one brakeman was killed. Three other trainmen were injured.

Electric Car Accidents.—Only three serious accidents are reported in the newspapers as having occurred on electric roads in the month of September, but all three are on what may be called high speed roads. None of the accidents was attended by fatal injuries. On the fifth, near Huron, Ohio, there was a butting collision between a "limited" train and a local, in which about 35 passengers were injured. Near Norfolk, Va., on the sixth, an express car collided with a work car, injuring the motorman and slightly injuring a number of passengers. At Woodside, Ill., on the 20th, an interurban train, in which was a sleeping car, was derailed and the sleeper rolled down a 15-ft. embankment. Twenty persons were injured.

*Abbreviations and marks used in Accident List:
rc, Rear collision——bc, Butting collision——xc, Other collisions——b, Broken——d, Defective——unf, Unforeseen obstruction——unx, Unexplained——derail, Open derailing switch——ms, Misplaced switch——acc, obst., Accidental obstruction——malice, Malicious obstruction of track, etc. ——boiler, Explosion of locomotive on road——fire, Cars burned while running—P, or Pass., Passenger train—F, or Ft., Freight train (including empty engines, work trains, etc.)——Asterisk, Wreck wholly or partly destroyed by fire——Dagger, One or more passengers killed.

Passenger Train Cars for the Northern Pacific

All-Steel Equipment of Standard Construction for Service Between St. Paul and Duluth and on the Pacific Coast

The Northern Pacific has recently received from the Pullman Company 47 coaches, 22 mail and express cars, 17 baggage cars and 6 dining cars of all-steel construction, 10 of the baggage cars and four of the mail and express cars being equipped with the head end generator sets of which two are of the axle machine train lighter type. The interesting feature of these cars is the marked similarity in their construction. The trucks are identical, the underframe practically so, and the framing only different in characteristic details, the coaches and diners

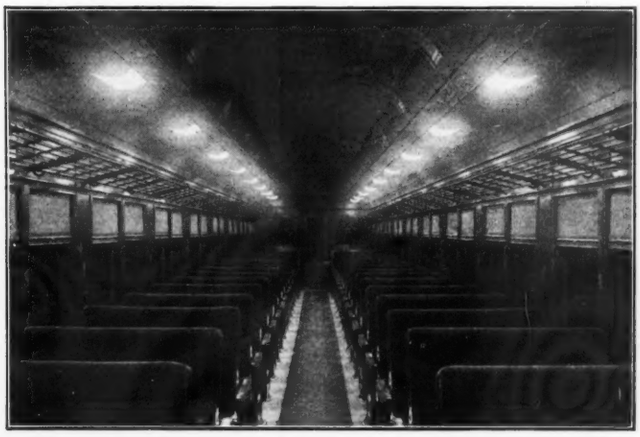
Interior of Northern Pacific Dining Cars

being designed to carry a live load of 20,000 lb. and 18,000 lb. respectively, and the other cars 50,000 lb. Many of the Northern Pacific standard parts were used and, where possible, steel castings were used in preference to forgings. The cars all have the same general dimensions, which are as follows:

Length over end sills (Dining Cars)	72 ft. 10 in.
Length over end sills (Other Cars)	70 ft. 10 in.
Width over side sills	10 ft. 1⅝ in.
Rail to top of floor	4 ft. 5⅜ in.
Truck wheels, number and diameter	6—36 in.
Journals	5 in. by 9 in.

The weight of the coaches is 141,100 lb.; the mail and express cars, 140,300 lb. without, and 146,200 lb. with, the lighting dynamo; the baggage cars, 127,800 lb., without the lighting dynamo, and 139,800 lb. with, and the dining cars, 160,100 lb. The coaches have a seating capacity of 84, and the diners 30. Vestibule ends are used on the coaches and diners, the side doors and steps being wider than usual. The other cars have stub ends.

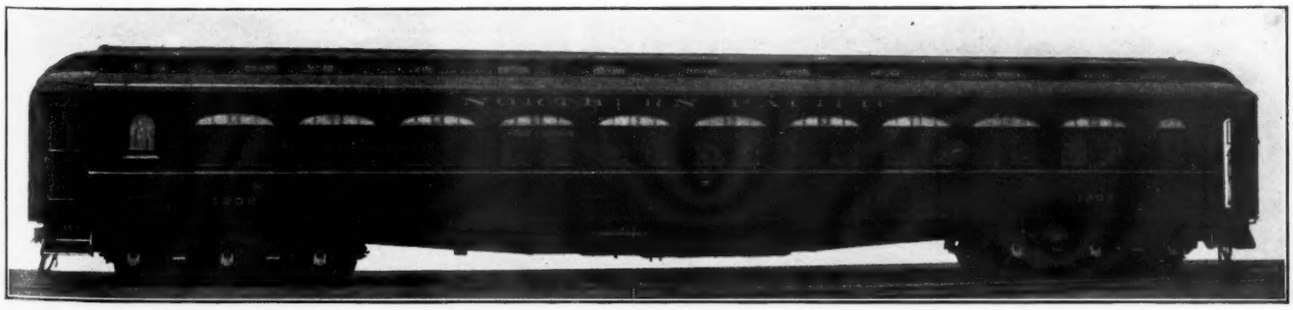
The coaches have a natural Mexican mahogany finish from the window sills to the lower head lining and 7/16-in. fireproof Agasote below the windows to the baseboard. The ceiling is of the half empire style, with 3/16-in. fireproof Agasote head lining finished in pearl color with gold stripes. The diners are finished in Cuban mahogany with the exception of the kitchen, which is finished in plain oak. Agasote is used below the window sills and on the ceiling, which is of the full empire style. It is decorated in pearl color with gold stripes. Pressed prism plate glass embodying the Northern Pacific monad emblem



Interior of Coach Taken Under Its Own Illumination

design at the center is used for saloon, deck and gothic windows of the coaches and diners. On the coaches the prism glass was applied both inside and outside at the gothics, while in the dining-room of the diners the space usually taken up by the gothics was incorporated in the main window, making a clear glass 36 in. high by 47 in. wide. These large and extra high windows are particularly adapted to afford unobstructed views. The oval aspect of the windows, which is the Northern Pacific standard for wooden cars, has been maintained in these cars. The flooring in the coaches and the dining rooms of dining cars is of flexolith the color of which is natural gray in the dining cars and tinted red color in the coaches to harmonize with the inside finish.

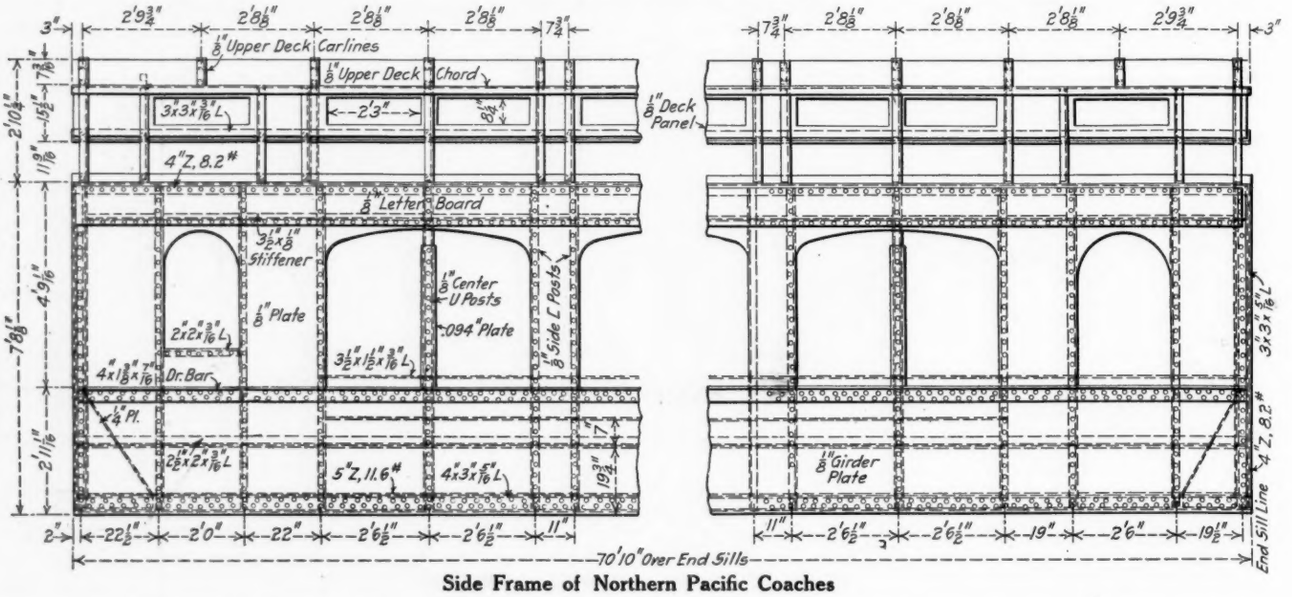
The baggage and the mail and express cars have an inside sheating of 13/16-in. by 5⅛-in. poplar, with a ceiling of 3/16-in. Agasote. A 1⅛-in. poplar partition separates the dynamo compartment from the rest of the car. All of the baggage and the



Northern Pacific All-Steel Passenger Coach

mail and express cars not equipped with dynamos were designed so that they may readily be so equipped. The mail and express cars were so constructed that the 30-ft. mail compartment can readily be converted into a 40-ft. compartment, and for that purpose a blind door was built in each side of these cars.

All the cars are equipped with Northern Pacific special buffing devices, which have a capacity of 350,000 lb., and also with three-

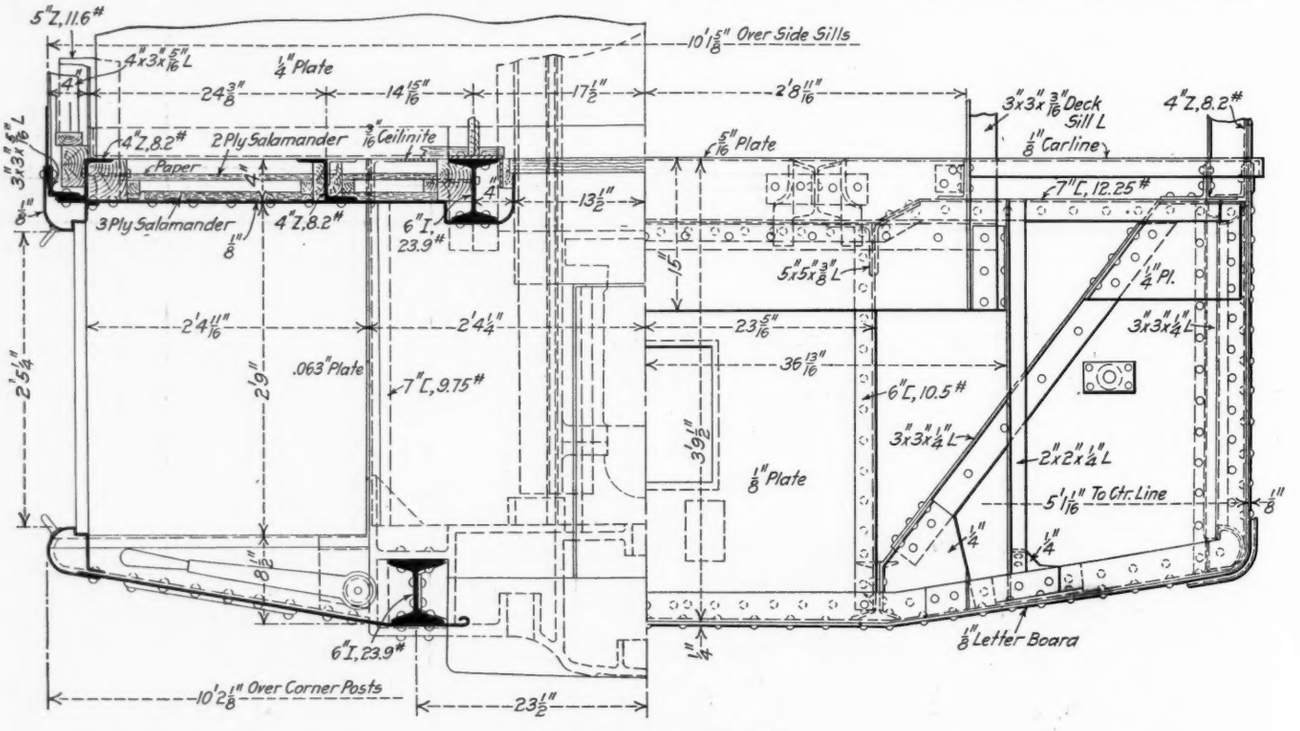


Side Frame of Northern Pacific Coaches

stem couplers having 8-in. tandem draft gear using one 8-in. plain and one 8-in. friction draft spring at each end of each car. The coaches, dining cars and combination mail and express cars are equipped with automatic deck ventilators with intake and

mechanism and at the center line of the draft gear, respectively. For this stress only the underframe members are considered, the superstructure being considered as supporting the underframe from buckling vertically.

The underframe is made up entirely of plates and structural steel shapes and is, in general, used on all types of cars included in this article. The center sill is of the fish-belly box-girder type with bottom cover plates only at the bolsters and cross-bearers. The body bolsters are of the double type, consisting of 5/16-in pressed steel pans placed back to back. A cast-steel center plate is enclosed in the center sill girder and is designed



Section Through Vestibule Ends

exhaust working in conjunction. Eighteen of these ventilators are provided for each coach and seventeen for each dining car.

Underframe.—The longitudinal sills are designed to resist the maximum shock due to buffing, which is assumed to be the equivalent of a static load of 400,000 lb. applied horizontally at the resultant lines of force acting at the center line of the buffing

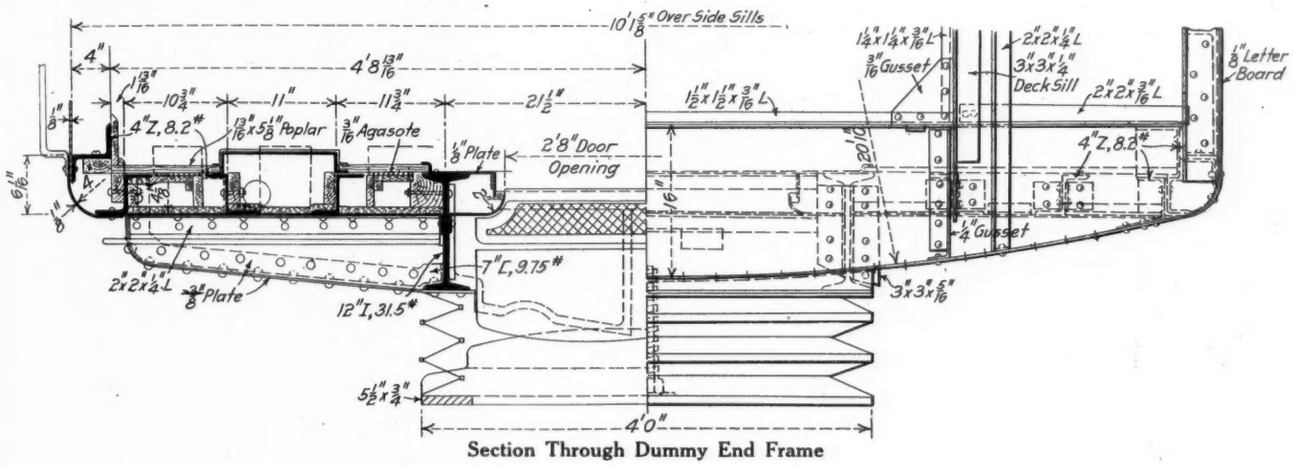
to receive the Coleman locking device. There are two crossties, one 9 ft. 3 in. each side of the middle of the car. The side sills are 5-in., 11.6-lb. Z-bars, extending in one piece from end sill to end sill. The end sills are ¼-in. pressed steel pans, 12 in. deep, extending between the side and center sills.

Side Framing.—The general construction of the side framing in

all types of cars discussed in this article is similar, the clerestory type of construction being used. The side posts are ⅛-in. pressed steel channel sections 4 in. wide placed with the backs at right angles with the side of the car. The side plates are 4-in. 8.2-lb. Z-bars. The upper and lower deck carlines and the deck posts are made of one piece of ⅛-in. steel plate pressed in the form of a channel.

directly to the center sill. An anti-telescoping plate extends across all sills back of the end sill.

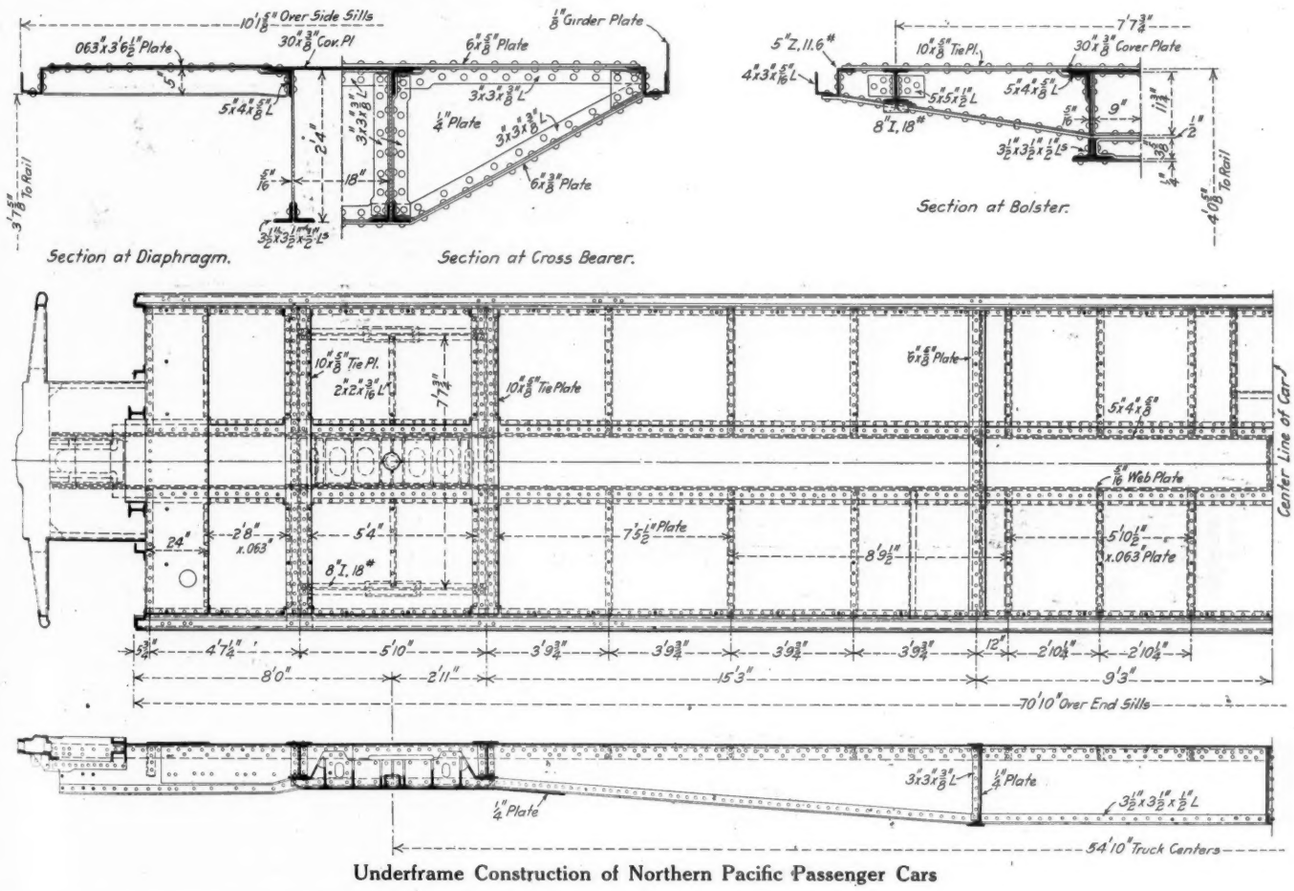
Insulation.—The insulation for the floors of the coaches and diners consists of a layer of ⅛-in. ceilinite cemented to the steel subfloor and passing under the six floor stringers, a layer of 3-ply salamander, an air space, a course of Neponset paper laid between the two courses of 13/16-in. fir flooring and a layer of



Section Through Dummy End Frame

In the vestibule ends four 6-in., 23.9-lb. I-beams form the door and vestibule diaphragm posts and four 4-in., 82-lb. Z-bars the intermediate and corner posts. The cast-steel buffer is mounted directly on the center sill and is further reinforced by

½-in. flexolith with wire netting laid on the top course of wooden flooring. The insulation for the side and end walls consists of a layer of 3-ply salamander cemented to the inside of the steel sheathing, an air space, a course of 2-ply salamander,



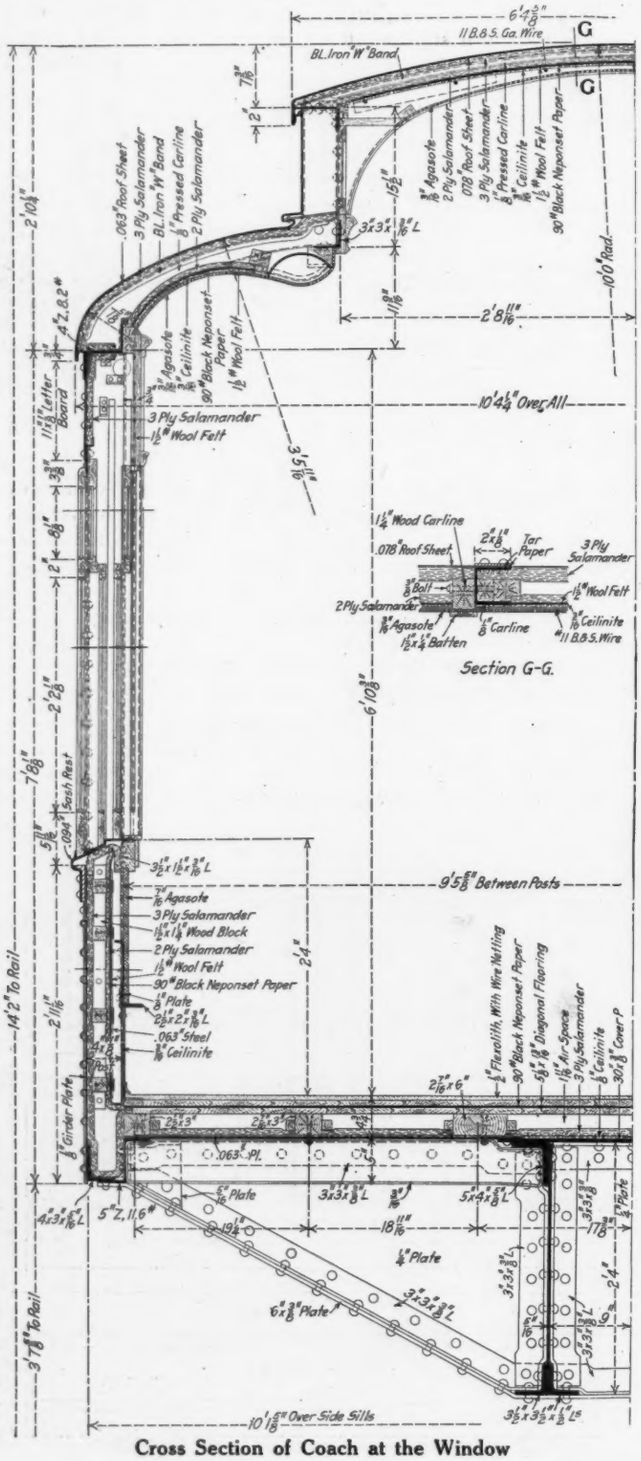
Underframe Construction of Northern Pacific Passenger Cars

a 7-in., 9.75-lb. channel 2 ft. 4¼-in. each side of the center line of the car. In the stub-end cars 12-in., 31.5-lb. I-beams are used for the door posts, and eight 4-in., 82-lb. Z-bars form the intermediate and corner posts, there being two corner posts at each corner. As in the vestibule end the buffer casting is attached

a layer of wool felt, a layer of Neponset paper, an air space and a layer of 3/16-in. ceilinite cemented to the inside lining. The insulation for the roof, including both the upper and lower decks, consists of a layer of 3-ply salamander cemented to the roof sheets, an air space, 2-ply salamander, Neponset paper, wool

felt and a layer of 3/16-in. ceilinite. These cars are equipped with Baker heaters and the Gold indirect steam-heating system with sufficient radiating surface to heat the cars to 70 deg., with an outside temperature of 50 deg. below zero.

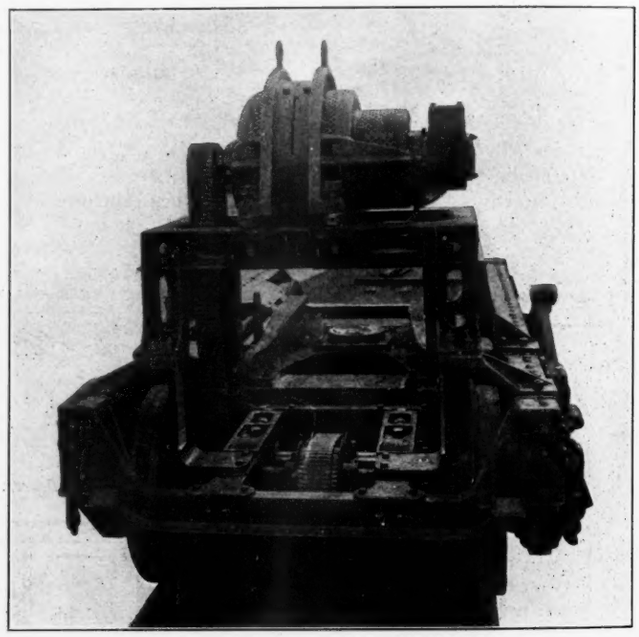
The insulation for the floors of the baggage, and mail and express cars consists of a layer of 3-ply salamander cemented to the steel subfloor, an air space and a course of Neponset



Cross Section of Coach at the Window

paper laid between the two courses of 13/16-in. flooring. The side and end walls are insulated with a layer of 3-ply salamander cemented to the outside sheathing, an air space, a layer of 2-ply salamander cemented to a layer of 3/16-in. ceilinite which in turn is cemented to the inside lining of 13/16-in. poplar. The upper and lower decks of the roof are insulated with a layer of 3-ply salamander cemented to the roof sheets. These cars are heated by the Gold direct steam-heating system with sufficient capacity to maintain a temperature of 70 deg. with an outside temperature of 38 deg. below zero.

Trucks.—Six-wheel trucks with structural steel frames are used under all the cars. They have a wheel base of 11 ft., open-hearth steel annealed axles with 5-in. by 9-in. journals, 36-in. solid steel wheels and a distance of 7 ft. 7¾ in. from center to center of the Stucki roller side bearings. Cast-steel parts are used instead of forgings where practicable. The truck bolster is cast steel. The center plates of the car body and the trucks are positively locked against any horizontal movement, and in addition the car body and truck are securely held together by the Coleman center plate locking device. The center plate faces provide 116 sq. in. actual or 101 sq. in. projected area of contact and were machined and ground together to a smooth working fit. The benefits of this, combined with the use of roller side bearings, are readily apparent. The braking of the truck is of special interest. One piece cast-steel brake hangers are used and they are longer than those ordinarily used on six-wheel trucks. Two brake beams are applied to the middle pair of wheels and one beam to the inside of



Axle Train Lighter Mounted on Truck

each of the outside wheels. The design prevents the back surge of the truck when it comes to a stop, the brakes applying with a slightly preponderant downward force on the rear of the truck.

Lighting.—All cars are wired for the 64-volt, head-end electric lighting system, straight electric with candle-lamp auxiliary. The dining-cars, dynamo cars and combination mail and express cars are equipped with 200-ampere-hour storage batteries. The electric wiring in all cars was installed in conduit. The dining-cars and coaches are equipped with a new system of car lighting which eliminates the projection of fixtures into the body of the car. The new-style fixtures used were very carefully and accurately designed to give a large amount of light without glare. The illustration showing the interior of the coach was photographed at night with its own illumination.

Ten of the baggage cars and two of the mail and express cars are equipped with a 25-kw. steam turbine set with a switchboard designed to allow charging of the batteries during the lighting hours. Two of the mail and express cars are equipped with 17½-kw. axle machine train lighters. These are mounted directly on the trucks and are driven through a jack shaft from the outside truck axle. The machine is driven by a Morse silent chain. One of the photographs shows the machine inside the

car. A heavy canvas webbing closes the opening in the car floor around the machine to keep the dust and cold air out. In service the machine and the opening in the floor are completely covered by a sheet iron casing.

An interesting feature in connection with the building of these cars is that the plans and specifications described the cars in such detail that the builders were able to place orders for material as soon as they received the contract (December 4, 1914) and where thereby enabled to turn out the first cars February 20, 1915. These cars have been made up into new steel trains running between St. Paul and Duluth, between Spokane and Seattle and between Seattle and Portland. In addition to these, the Pullman-Northern Pacific Association has supplied 21 new steel standard sleepers for use in these trains.

INDUSTRIAL TRUCKS ON THE PENNSYLVANIA*

By T. V. Buckwalter

The industrial electric motor truck as at present developed comprises baggage and mail trucks for use in passenger stations, warehouse trucks for freight stations and warehouses, shop trucks for railroad shops and general industrial purposes and electric tractors for propelling freight cars over street railway tracks.

There are no well-defined lines of demarcation between the first three classes. Baggage trucks are characterized by a height of about two-thirds the distance from the platform to the baggage-car floor, about 30 in. The length is controlled generally by existing elevator sizes and ranges from 9 to 12 ft. The width is generally 44 in. A modification of the baggage truck has a

Baggage Truck—Straight Frame Class

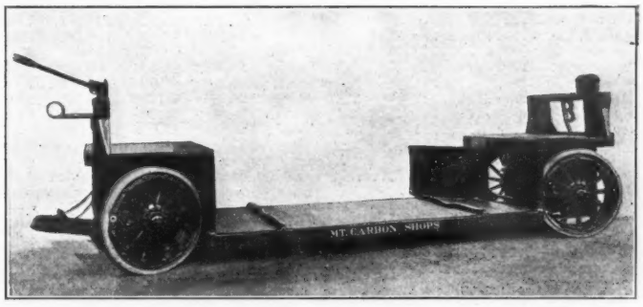
body only 9 in. high for use in depressed track stations where the car floor is but slightly higher than the station platform.

The electric warehouse trucks are characterized by a depressed portion at one end to facilitate loading, and delivery of the load into the end of a freight car. The restrictions limit the height to about 10 in., the width to about 40 in. and the over-all length to less than 9 ft. Shop trucks are subject to a variety of conditions as regards relative size and bulk of material handled. This has required a number of modifications in sizes. A distinct shop truck class has therefore not been developed but adaptation has been made of baggage and warehouse classes.

Railroad stations and shops are generally congested, and runways are narrow, therefore with the object of avoiding entirely the necessity of turning around, which would block other traffic, railroad industrial trucks have been constructed with double-end control. This feature permits of operation with equal facility in either direction, reducing congestion to a minimum. An exception is the warehouse truck, which must have the low frame suitable to run into freight cars.

Space required to turn can be reduced still further by steering four wheels instead of two, and operation is made exactly identical in either direction. This eliminates the practice of running two-wheel steering trucks backward.

Sufficient traction for all ordinary work is available with two-wheel driving and therefore four-wheel driving complication is avoided. The voltage of industrial trucks has been selected after a careful study of the advantages of prevailing commercial truck standards and of much lower voltages, and was finally



Drop Frame Shop Truck with Transverse Rail for Carrying Mounted Wheels

adopted at 24 volts as the minimum at which efficient motors were obtainable, in consideration of the preponderant advantages of the low-voltage battery. The 24-volt battery has the minimum number of cells, and minimum number of connectors, and consequently the minimum possibility of jar and connector breakage, the minimum cost per unit of capacity and the minimum weight per unit of capacity.

The capacity of industrial trucks was worked out at 4,000 lb. as the maximum that could be handled within narrow and congested enclosures readily and safely, in consideration of the absolute necessity of quick stopping and positive and quick manipulation of control mechanism. Larger than 4,000-lb. trucks are too cumbersome, and smaller trucks will not carry enough to realize the full efficiency of the service. A 50-per cent overload factor has been found desirable, which makes a total weight as much as can be handled quickly.

Shop Truck—Warehouse Class

High-speed capacity has been found of little or no value, for the reason that the speed is limited by the amount of congestion of runways, and by the presence of other people who have other duties beside looking out for trucks. Therefore the

* Abstract of a paper read before the Electric Vehicle Association, at Cleveland, October 18.

speed has been reduced gradually as our experience has increased to the present standard of 6 to 7 miles an hour with the empty truck and 5 to 6 miles an hour loaded.

OPERATING RESULTS

The records of operation for the year 1914, including all labor and operating charges for a total of 212 trucks, show:

ELECTRIC TRUCKS; SUMMARY OF DATA, 1914

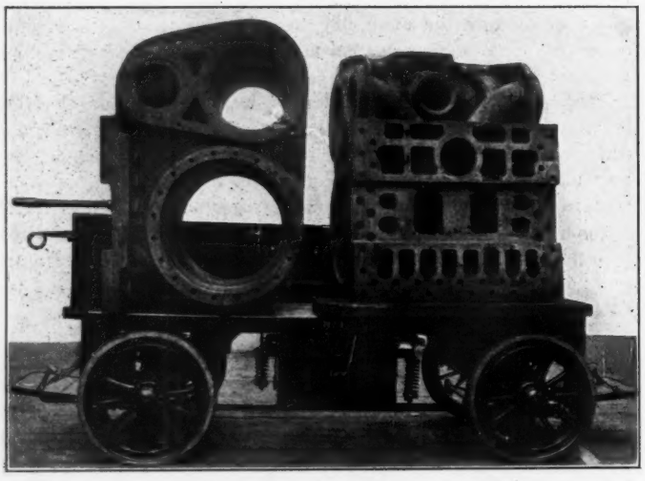
Shop trucks

Shop	Average monthly data all trucks: No. of trucks	K.W.H.	Cost of current	Total cost	Averages per truck month: Total cost	Saving	Percentage
Harrisburg	1	209	$5.43	$70.00	$70.00	$154.00	100
Verona	1	587	8.81	82.00	82.00	154.00	99.8
Trenton	1	792	9.90	67.00	67.00	134.00	87
Juniata	2	1,426	11.14	131.00	65.00	109.00	70.5
Altoona Car	3	1,251	8.57	190.00	63.00	96.00	62
Renovo	2	1,168	18.05	136.00	68.00	93.00	60.4
Altoona Mach.	9	2,342	14.06	788.00	87.00	92.00	59.5
Pitcairn	4–5	789	4.05	312.00	67.00	89.00	57.9
Meadows Shop	1	734	29.40	34.00	34.00	21.00	14
Jersey City, Pier L.	3–5	1,340	45.77	173.00	51.00	.....	...

Baggage trucks

Station	Average monthly data all trucks: No. of trucks	K.W.H.	Current cost	Total cost	Averages per truck month: Total cost	Percentage
Baltimore	2	953	$11.50	$27.00	$13.00	100
Philadelphia	34–35	6,821	88.66	421.00	16.00	81.2
Pittsburgh	17–28	6,731	34.96	503.00	17.00	76.5
New York	64–66	5,016	66.63	1,184.00	18.00	76.1
North Philadelphia	4–10	1,534	43.56	154.00	24.00	55.3
Washington	18	11,810	85.88	455.00	25.00	54.4
Jersey City	3–5	956	19.12	115.00	29.00	46.5
Harrisburg	1	588	12.01	66.00	66.00	20.6

For the shop trucks the total cost includes the wages of the driver, which, under differing circumstances, varies from $32 to $60 a month; repairs of trucks, repairs and renewal of batteries, and new material for trucks, batteries, and tires. Of the shop trucks that at Harrisburg made the best record and is entered as 100 per cent; the ratio of the others is calculated on the Harrisburg record as standard.



Shop Truck—Straight Frame Class

The wide variation in some of the charges is due to difference in current cost ranging from 0.5 cents to 10 cents per K. W. H. to the number of trucks in the installation, and to the character of the work.

The figures for the baggage trucks do not include charges for drivers for the reason that the trucks are driven by the baggage porters.

The installations are given an efficiency standing based on the saving on shop trucks and on the cost of operation on baggage trucks. In the shops these trucks handle work formerly done by manual labor and the saving is readily computed. However, the figures do not represent the total saving, as, for instance, the increased efficiency of the shop due to having material handled on a regular and prompt schedule does not admit of calculation. The old practice of helping out the labor gang with machinists is largely done away with.

The saving effected in baggage service is considerable but the figures are not sufficiently complete to be presented at this time. This saving is difficult of calculation. The character of the service has changed considerably since the introduction of electric trucks. The parcel post, formerly non-existent, is now a large and important part of the work. The labor force has not, generally speaking, been decreased, but, on the other hand, the business has increased. Rush periods can now be handled without borrowing untrained men from other departments, and a better class of men continue in service, as compared with the rapidly changing force in the old days. The operating officers consider that the most important advantage of electric baggage trucks is relief to terminal congestion and prompt despatch of trains resulting from avoidance of baggage detention. The saving effected is not stated on certain installations. This does not indicate an absence of a saving, but the failure of the operating people to ascertain the amount in time for this paper. The installations omitted would be near the top of the list. Under the heading "Number of Trucks" is indicated the number at the beginning and the end of the year, but the averages are based on actual truck months.

ELECTRIC TRACTOR

The electric tractor has now been in service 31 months and has proved entirely satisfactory. A description of this machine will be found in the *Railway Age Gazette,* January 9, 1914. It replaces horses for moving freight cars on tracks laid on paved streets. The tractor runs on the pavement like an automobile truck. Cars can be pulled or pushed by either end of the tractor. Steering, driving and braking is on four wheels. The size of tire is 60 in. by 6 in.; the weight 29,000 lb., and the drawbar capacity, 8,000 lb. at two miles an hour. The normal speed with one car on level tangent is six miles an hour. Brakes can be operated by hand or automatic air. Radial draft gear with standard couplers is provided at each end. Driving gears are 33 in. in diameter and 4 in. wide on each wheel.

During 1914 this tractor was in service an average of 7.6 hours a day, with 6.7 hours on a charge; an average discharge daily of 478 ampere hours, and an average of 11.5 miles daily. The average number of cars moved daily was 29.4 in addition to 20.5 "internal" movements. The total number of cars moved in the year was 8,562 in addition to 5,956 "internal" movements, and the total weight of these cars, in tons, was 219,382.

The record for the first seven months of 1915 shows the average hours in service daily to be 8.2; the average miles, 12.8, and the average number of cars moved 36.3, in addition to 25 internal movements.

"Internal movements" means cars moved from point to point within the track territory operated by the tractor. These movements are not included in total costs in service.

From the records of the 2½ years the following data may be derived:

Cost of tractor		$13,400.00
Cost of maintenance and operation, 2½ years	$13,145.67	
Interest at 6% on $13,400, 2½ years	2,010.00	
Depreciation, less tires and battery, $13,400 — $4,200 = $9,200 at 5 per cent, 2½ years	1,150.00	
Depreciation battery $3,200 at 25 per cent, 2½ years	2,000.00	
	$18,205.67	
Total cost of service, 2½ years		$18,205.67
Total number of cars (in and out) 2½ years		22,639
Total cost of service if horses had been used, 22,639x$1.86		$42,108.54
Saving by electric tractor, 2½ years		23,902.87
Saving over investment, 2½ years		178.4%
Saving over investment, 1 year		71.4%
Total cost of service per car, 18,205.67 ÷ 22,639		$0.805
Average weight per car		33,196 tons
Cost of service, per ton (in and out)		0.0243
Total miles operated		8,804.3 miles
Total number cars handled in internal movements		15,202 cars
Grand total cars (in, out and internal)		37,841
Cost of maintenance and operation per car (in, out and internal) 13,145.67 ÷ 37,841		0.347
Cost of maintenance and operation per ton (in, out and internal)		.0104
Cost of maintenance and operation per mile 13,145 ÷ 37,841		1.49
Cost of service per working day by tractor		24.67
Cost of service per working day by teams		57.06
Saving per day		32.39

There has been a gradual growth of service in number of cars moved per month from 690 to 920 cars, during a period when railroad business has been stationary. At the same time

the cost per car has decreased from a maximum of 83 cents to 58 cents.

Mr. Buckwalter amplified the statement of cost with details by months, from which it appears that since September, 1914, the average expense per month for driver has been $7,165, as compared with $13,451 per month for the corresponding period prior to October, 1914, indicating that formerly a driver's mate was employed.

NATIONAL ASSOCIATION OF RAILWAY COMMISSIONERS

The annual meeting of the National Association of Railway Commissioners was held at San Francisco, Cal., on October 12, 13, 14 and 15. In his opening address as president of the association, Clifford Thorne, chairman of the Iowa Railroad Commission, vigorously defended state regulation as opposed to what he characterized as a tendency toward complete federal regulation. Mr. Thorne said in part:

"Too much 'nationalism' is just as wrong as too much 'states' rights. There is a happy medium. It is not this government as one nation, not the several states, but the combination in one federal plan that has rendered such a distinct contribution to the welfare of humanity. It is this federal plan that must be most jealously guarded. A tendency one way or the other, towards centralization or toward decentralization, is dangerous.

"For several years there has been gradually developing in this country a sentiment in favor of wiping out state lines. An agitation, partly spontaneous and partly inspired by interested persons, has been carried on to support a change in our judicial decisions relative to the powers of a state to regulate business. It is now vigorously claimed that the time has arrived for the practical abolition of all state regulation. Such a change in the American plan of government would be of stupendous importance. The issues of today concern vast property interests, and the future policies of state and nation on many grave questions of business are vitally concerned."

After reviewing the Minnesota rate case and the decision of the United States Supreme Court, Mr. Thorne said: "The court said that the question as to whether federal regulation of commerce shall supplant state regulation is not a question for the judiciary to determine; it is legislative and not judicial in character. It now becomes, not a question of precedent or of statute, but one of expediency, of wisdom.

"Within the next 25 years substantially all our commercial affairs will be carried on by companies doing both state and interstate business. What is good for railroads will be good for others. Shall we abandon our state governments, so far as the regulation of business is concerned? Here is an issue which strikes at fundamentals; which has to do with the method of government.

"In striving after the new, we frequently fail to realize the intrinsic value of the old. What is the fundamental characteristic of our government? It is the creation of a nation, large and strong enough to assert its independence among the world powers; at the same time combined with a form of government securing real tangible home rule to the various independent sovereignties making up that nation.

"If the national government is permitted to gradually absorb the functions formerly exercised by the states, it will only be a question of time until some great evil will demand some great remedy. Agitation will follow agitation. There will be no opportunity to try out the new proposal; the nation as a whole must adopt it or reject it. We believe the federal plan, as conceived by our fathers, is better than the new nationalism. We believe the states are a distinct factor in our scheme of government."

Judson C. Clements, of the Interstate Commerce Commission, addressed the meeting on the subject of federal regulation of railroad securities. Mr. Clements said that there must come a time when some single tribunal will control this phase of railway operation. "It will be a long time," he said, "before effective legislation can be secured by the states, and public ownership should be resorted to only as the last resort." Mr. Clements said that politics would figure too largely in the management of government-owned roads.

It was decided to establish a bureau at Washington to represent the interests of the states and to assist the Interstate Commerce Commission in its work of making a valuation of railroad property, and the following committee was appointed to take charge of the new bureau: C. E. Elmquist of Minnesota, Clifford Thorne of Iowa, G. A. Henshaw of Oklahoma, Max Thelen of San Francisco, C. B. Aitchison of Oregon, J. L. Bristow of Kansas, and E. C. Niles of New Hampshire. A resolution was adopted advocating legislation to give railroad commissions power to eliminate grade crossings. The committee on railway service and accommodations submitted recommendations that every state be urged to enact laws against the use of liquor on trains. R. R. Prentiss of the Virginia commission was elected president of the association for the ensuing year.

ECONOMIC VALUE OF TERMINAL IMPROVEMENTS AT DETROIT

One of the important engineering works of the country completed within recent years is the double tube tunnel under the Detroit river, connecting the American and Canadian divisions of the Michigan Central.

Detailed descriptions of the work* and the numerous difficulties successfully overcome, from an engineering standpoint, were made public from time to time during construction. The tunnel was opened for traffic in 1910, and has entirely superseded the use of ferryboats for transferring Michigan Central freight and passenger traffic across the river. Sufficient time has now elapsed to fully test the estimates of the advocates of the plan as to the advantages it was believed would accrue from a materially reduced cost of handling traffic and time saved in transportation.

There are usually one or more points upon trunk lines with a fluctuating volume of traffic which tend to limit the amount of business that may be handled economically on the whole line. When the traffic load approaches the peak, congestion is found at these points, the whole line becomes affected and operating costs rise abnormally. Such a place was the Detroit river ferry over which all the through traffic of the Michigan Central had to pass, and as early as 1870 plans were made for relief from the limitations this method of transfer imposed. With the engineering facilities then available, a projected tunnel was found to be impracticable of construction because of the conditions which tests disclosed in the river bottom.

Various plans involving the erection of a bridge were discussed, but these were finally abandoned in 1904 for the reason that the clearances demanded for lake vessels would have required a structure of such height that it would have been necessary either to establish grades impossible of operation, or construct approaches of such great length that the cost would have been prohibitive.

The growing traffic and vexatious delays pressed for a solution of the problem, and in 1906, confronted with the necessity of making large additions to its ferry transfer equipment, the Michigan Central appointed a committee to study the situation. The committee reported that a tunnel could be built within reasonable limits of cost, and that in operation it would be economical enough to justify the investment. Plans were then adopted for the laying of twin tubes under the river, and, as a necessary adjunct thereto, provision was made for a new passenger

*For description of tunnel, see *Railway Age Gazette*, November 10, 1911, page 945; for description of tunnel yards, see August 18, 1911, page 334; for description of Detroit terminal passenger station, see January 9, 1914, page 73.

station in Detroit and for new yards and terminals required by the change in location.

In the construction of the tunnel, lying partly within the United States and partly within the Dominion of Canada, it was necessary to organize separate tunnel companies, one under the laws of Michigan and one under the laws of the Dominion of Canada. These companies were subsequently consolidated under the name of the Detroit River Tunnel Company, which was authorized to build and own the property, all of which has since been leased to the Michigan Central. Construction work was begun in 1906 and completed in 1910. The terminal building was opened for use in December, 1913, a short while before its completion, on account of the destruction by fire of the old station. The entire property—that is, the Detroit River Tunnel Company—was capitalized at $21,000,000, of which $3,000,000 was in capital stock, all owned by the Michigan Central, and $18,000,000 in fifty-year first mortgage 4½ per cent bonds. The money was expended for the cost of building and equipping the tunnel, for rights-of-way, separation of grades at street crossings, and the construction of the new passenger station, yards and other terminal facilities.

Up to 1910, all Michigan Central trains were ferried across the Detroit river, requiring the breaking up of through trains and involving many switching movements and a delay of from three to eight hours per train in through freight service. On account of the swift current in the river, the frequent use of the channel by steamships, and the added difficulties of fogs in the summer and autumn, and ice in the winter, it was found impossible to maintain schedules or to regulate traffic in a satisfactory manner.

Since the opening of the tunnel for operation, the average time of passenger trains between Windsor and the new Detroit terminal, in either direction, is about nine minutes, or less time that it formerly required simply to place the trains on the transfer boats.

The average time required for moving a freight train through the tunnel is about twenty minutes, as compared with several hours required for breaking up, switching, reassembling and ferrying trains under the former method of operation, in addition to which they were frequently subject to more or less serious delays crossing the river because of weather conditions, ice, etc.

This saving of time has been particularly advantageous in the handling of traffic requiring expedited transit, such as perishable commodities. Thus, the railroad has been in a position to give better service because of the removal of the main cause of delay, but has been able to improve its operating efficiency on this division by greatly increasing the train loads since it has been possible to send solid trains through the tunnel.

The following statement indicates the growth in average monthly operating revenues which the Michigan Central has enjoyed since opening the tunnel:

	Three-Year Monthly Averages		
Monthly Passenger Earnings:	1907-9	1912-14	Increase Per Cent
Summer months	$645,935	$838,056	29.74
Winter months	470,209	634,164	34.87
Average throughout period	$558,072	$736,111	31.90
Monthly Freight Earnings:			
Summer months	$1,481,740	$1,791,970	20.94
Winter months	1,494,737	1,830,530	22.47
Average throughout period	$1,488,238	$1,811,250	21.70
Monthly Passenger and Freight:			
Summer months	$2,127,675	$2,630,028	23.61
Winter months	1,964,946	2,464,694	25.43
Average throughout period	$2,046,311	$2,547,361	24.49

Just how much of the increased traffic represents a normal growth and how much comes from the better service which the road renders cannot be ascertained.

Important as are the benefits mentioned to the public and the railroad resulting from the construction of the tunnel, a feature of equal importance, particularly from the railroad viewpoint, is the fact that the total cost of transfer is now considerably less per car than it was under the old method of ferrying across the river. Although the investment in the tunnel property and equipment is about eight times as large as that required for the transfer boats and slips, the cost of switching and operating the trains, and maintaining the property is so much lower that the higher interest charges and taxes are more than offset.

Statistics for the year 1914, as compared with the year 1908 when the transfer boats were in operation, show that there has been a large saving in the cost of switching service, although the number of cars transferred across the river in 1914 was greater than in 1908.

A material saving has also been obtained by the transferring to the new freight yards at Windsor, constructed for this purpose, of all the switching operations necessary on through freight trains, thus relieving the Detroit yards (which were rapidly becoming congested and overcrowded owing to the extraordinary industrial growth of Detroit) and increasing their capacity about 40 per cent. Another item, the exact amount of which cannot now be computed because of the loss of records by fire, is the saving in per diem charges on loaded and empty freight cars, particularly empty cars, many of which were formerly frequently held back on either side of the river as a matter of necessity in order that the forwarding of loaded cars might be expedited. Under present conditions, there being no congestion at this point, empties are forwarded without delay.

The traffic through the tunnel represents but a small percentage of its capacity. If it continues to increase in the next few years as it has in the past decade, the Michigan Central will find the tunnel to be an increasingly valuable asset, and one without which it would not be able to render the service that will be absolutely required of it if it is to maintain its standing as a trunk line.

It is not possible as yet to determine the decreased cost of handling passenger trains that will result from the use of the new station. A more convenient arrangement of the tracks has undoubtedly effected a reduction in cost. The better location of the station and the better service the tunnel affords have undoubtedly attracted to the line a larger number of passengers.

In planning the new station and terminal at Detroit, and following the scheme of development applied to the Grand Central Terminal in New York, the company has included its own offices in the building and has reserved for renting purposes certain parts of the property, the income from which, it is expected, will meet a large part of the interest charges on the terminal investment.

The improvements at Detroit afford an example of a relatively large investment concentrated at one point. Following the general policy of the New York Central Lines with regard to important changes, this improvement is not a temporary makeshift, but has been installed with liberal provision for present needs and ample capacity for growth in the future. In this case, the wisdom of the investment has already been demonstrated, not only from the standpoint of economy and consequent benefit to the owners of the property, but in greatly promoting the public service as well.

A BRITISH RAILWAY'S EQUIPMENT.—The North British Railway Company owns over 60,000 freight cars and the number awaiting repair is normally about 1,000. Owing to the various adverse conditions resulting from the war the number awaiting repair at the present time is about 5,000. Notwithstanding this the supply of cars to the ironmasters and coal mines was never so satisfactory to the trade as it is just now. This is due to the car supply on the North British being controlled from the train control office, which is at Portobello, a point not far from Edinburgh.

Maintenance of Way Section

Recent Developments of Water Tanks

The report on water tanks presented before the convention of the Bridge & Building Association this week, and abstracted on another page in this issue, calls to mind the changes which have been made within the last few years in the manner of storing water for locomotive use at outlying points. It is only a few years since water was almost universally stored in wooden roadside tanks of 50,000 to 60,000 gal. capacity, located alongside the track and delivering directly to locomotives. Today the capacity has increased until the 100,000-gal. tank may be said to be standard; the steel tank has replaced the wooden tank on many roads, and frequently the tank is set back from the track and water is delivered to the locomotives through a standpipe. These and other developments make necessary the continued study of this problem by those having to do with water tank installations. It is especialy important, in determining between wood and steel tanks, to study the relative merits of the two materials for use in particular locations, for the quality of both of these materials obtained has been changing rapidly. It is necessary to scrutinize carefully not only the materials entering into the tanks proper, but into their accessories as well, for a tank is serviceable only so long as all of its appliances are serviceable.

The Development of Special Steels

In 1897 the average freight traffic density of the railways of this country was approximately 482,396 ton-miles per mile of main track and the average passenger traffic density 62,144 passenger-miles per mile of main track. In 1913 these figures had increased to 1,095,000 and 126,300, respectively. Thus, in 16 years the average amount of traffic passing over each mile of main track had doubled. These are necessarily average figures and do not indicate the amount of traffic passing over the points of greatest congestion. On portions of several roads the freight traffic movement alone over certain parts of the lines exceeds 20,000,000 ton-miles annually, and the movement over each track is proportionately large. Nevertheless, these figures denote in a general way the increased service required of the tracks all over the country. The unit of track construction most directly affected by the density of traffic is the rail; and especially is this true at the points subject to the most severe attacks, as in the case of the high rails on curves and special construction at frogs and crossings. With this large increase in the service demanded, it is not surprising that there have arisen many instances of rapid rail wear. This has led to efforts to secure some metal other than Bessemer or open-hearth steel which will give a greater life at these particular places, and has given rise to the experiments with special steels described by W. C. Cushing in another column. To be successful, any substitute metal must possess the valuable qualities of the present open-hearth steel, while at the same time affording a greater resistance to wear, and must yield itself to manufacture at a cost sufficiently low to enable it to be used with economy. These are rigid requirements and it is neither surprising nor discouraging to note that no entirely satisfactory substitute has yet been developed. Material progress is being made in the development of materials of the required physical characteristics and with increased use the cost of manufacture will decrease materially. It is important that these and other experiments be continued, even at heavy initial cost to the railroads as well as to the manufacturers, for it is certain that the traffic will continue to grow in the future as it has in the past, and that the demand for rail materials giving greater resistance to wear will gather momentum from year to year. It is not beyond the range of possibility that the ultimate solution will be the development of several grades of rail material of varying resistances to wear and corresponding cost for use on lines of different traffic densities.

Rating of Concrete Mixers

Competitive commercial enterprises are frequently hampered by the lack of proper standards for the control of quality, quantity, weight and sizes of the various products. A loose interpretation of inadequate standards or the entire absence of such standards always works to the disadvantage of the conscientious dealer in favor of his unscrupulous competitor. The purchaser also suffers. Fortunately these conditions no longer obtain in most well-established lines, because of the rules, specifications and standards adopted by the various manufacturers' associations. A recent example of this is the action taken by the National Association of Mixer Manufacturers for the standardization of the rating of batch concrete mixers. It is a well-known fact that the batch capacity of a mixer of unmixed sand, stone and cement is about 50 per cent greater than its capacity for mixed concrete, and up to the present some mixer manufacturers have been rating their machines by their capacity in mixed concrete, while others rate them by their capacity in loose, unmixed material. The action recently taken by the mixer manufacturers was in the form of a resolution which provided that the members of the association shall specify the capacity of their mixers as "size of wet mixed batch" in catalogues and circulars and not otherwise. It also provides that the dry, unmixed capacity of a mixer may be approximated as one and one-half times the wet mixed batch, on the basis of a stone concrete with 1½ in. crushed stone and 1¾ gal. of water per cubic foot of mixed concrete. The Association of Mixer Manufacturers is to be commended for this action.

THE DANGER POINT IN RETRENCHMENT

A GREAT deal of attention is being given to the "Safety First" agitation, and it is to the credit of the railways that they have led in this movement. Numerous more or less important measures have been adopted to increase the safety of travel, many of which have involved the expenditure of large sums of money. As an example, the extension of automatic block signals may be cited. In many cases such installations have been made for the economic purpose of increasing the capacity of the line, but in many other places, large expenditures have been authorized primarily for considerations of safety on lines where a congestion of traffic did not prevail.

The past few years have been years of declining railway revenues in the face of increasing expenses, a condition requiring strict retrenchment and the conservation of resources. In such times the problem is to distribute the limited funds available where they will go furthest toward accomplishing the desired result, there not being resources available sufficient to do all the work desired. Under these conditions, great care must be exercised to maintain all units of the property to the proper standards of safety.

In any period of retrenchment, the first and most drastic reductions in expenditures are ordinarily made in the maintenance of way department. During the year ending June 30, 1915, the average expenditure for maintenance of way and structures for the railways of the country decreased about $210 per mile of

line, or 11 per cent. While the effects of restricted expenditures are not ordinarily reflected at once in the condition of the track and structures, this last reduction, coming after an extended period of retrenchment, has caused the condition of much track to deteriorate seriously and in many cases to the point of danger.

It is, of course, impossible for a railway to spend money which it does not earn or possess, and for the policy of slow starvation which is being carried out by the state and federal regulating authorities, they must accept their full measure of responsibility. But, regardless of the cause of present conditions railway officers must also accept responsibility for so distributing the funds at their disposal as to secure the greatest degree of safety for the traveling public. In this connection, those in charge of the maintenance of the track and structures should bring to the attention of those responsible for the distribution of funds the actual condition of the property, particularly at those points where travel is endangered. If the higher officer is then unwilling to make the proper expenditures, he must accept the responsibility.

In these days of labor agitation, great dependence is placed on the unorganized, poorly paid section foreman who is expected to maintain track safe for high speed trains 24 hours in the day, frequently with only two or three foreign speaking assistants, and with no 16-hour law to protect him in times of storm or wet weather. Furthermore, when retrenchment comes, the amount of ballast, rail and other materials furnished for maintenance purposes is reduced, and at the same time the foreman is given less labor, although his track requires more attention and the trains run at the same speeds. After all, the track is the first essential to safe railway operation and without good track the best equipment and the most elaborate signals are ineffective.

SELF-EDUCATION

IT is a common complaint among all ranks of maintenance of way employees that few opportunities are presented for promotion to positions of more responsibility and correspondingly greater rewards. At the same time the executive officers of railways lament their inability to secure men properly prepared to fill vacancies in this department as they occur. If these two apparently contradictory conclusions are correct, and it must be admitted that there is merit in each, it is pertinent to inquire what measures are being taken to bring the men and the positions together.

All branches of maintenance of way work are changing rapidly and the standard methods and materials of only a few years ago are fast becoming obsolete. The introduction of special materials, such as heat treated bolts, and of devices such as rail anchors, the use of treated ties and the adoption of motor cars, illustrate recent developments in track work. The widespread use of concrete and measures for its proper preparation, the use of fuel oil engines in pumping stations and the construction of more scientifically designed track scales are of similar importance in other branches of this department. To serve his company best, as well as himself, a man must keep abreast of these developments and do his share in perfecting them. This requires that he must use all the available means for educating himself to greater efficiency.

A few years ago opportunities for education along the line of a man's work, but outside of his regular daily activities, were very limited. Fortunately this condition is rapidly disappearing and information is available today for men of all ranks. For the man who desires that his line of study be directed for him, courses of instruction have been prepared which will give him, step by step, a broad working knowledge of his duties. These courses are available for officers and employees in practically all ranks of the maintenance of way department. Realizing the merits of such courses, several railroads are now placing them at the disposal of their men in the lower grades without expense to them.

For the man who prefers to select his own literature, the number of books on railway subjects is increasing constantly, while the railway journals present information concerning recent railway developments from week to week, and from month to month.

The universal demand for trained men and the means for self-education so generally accessible, should afford sufficient incentive for the wide-awake men to so prepare themselves. It is significant that some of the most prominent men in the railway field today are those who were denied the privileges of a college education and who have advanced to their present high positions by dint of hard study, and it is interesting to note that, having attained success, they retain their same studious habits. The same opportunities are presented, to a degree at least, in all ranks, even to the most humble. Within the past year one general manager went to the man in charge of educational work on his road for a list of track laborers whose educational work indicated they were fitted for foremen, and out of a list of 80 men so selected he secured practically his entire quota of section foremen for the year. There has never been a time in the history of our railways when trained men were in so much demand in all ranks as today. The man who properly equips himself for the work of the position he now holds and continually endeavors to fit himself for the position just above it will almost certainly secure recognition and advancement. What is true in this regard today will be true to an increasing extent from year to year.

THE RAPID DEVELOPMENT OF CONCRETE CONSTRUCTION METHODS

IN a spirit of conjecture, perhaps not unalloyed with flippancy, the bridge engineer of a certain railroad recently suggested the following picture of the future of concrete construction on railroads: After the excavation has been completed, a gang of carpenters will build the forms complete to the last detail. When all is ready a "concrete train" will arrive on the ground and, in a manner comparing favorably with the operation of a modern fire department, a few active, skillful men will run out lines of hose or flexible pipe and proceed to "squirt" the forms full of concrete. It must be admitted that this sounds somewhat like the prophecy of a well-known American inventor which had to do with concrete houses built in a day in cast iron forms, with furniture and plumbing all in place, etc., but which unfortunately has not been fulfilled. On the other hand, the picture outlined above was a result of a close association with the concrete industry and was drawn in the light of the recent developments in the making and placing of concrete.

Reviewing the use of concrete during the last twenty years, the first ten were marked by the development and application of the theory of reinforced concrete design; the second ten by a wonderful advance in the making and placing of concrete. It is believed that this will account for a recently observed tendency toward a return to the use of mass concrete in place of reinforced concrete in certain classes of retaining walls where mass concrete can serve the same purpose. Where it can be handled in large quantities, concrete can now be made and placed so much more cheaply than formerly that the saving of concrete in the thin reinforced wall is largely neutralized by the greater cost of the reinforcement and form work.

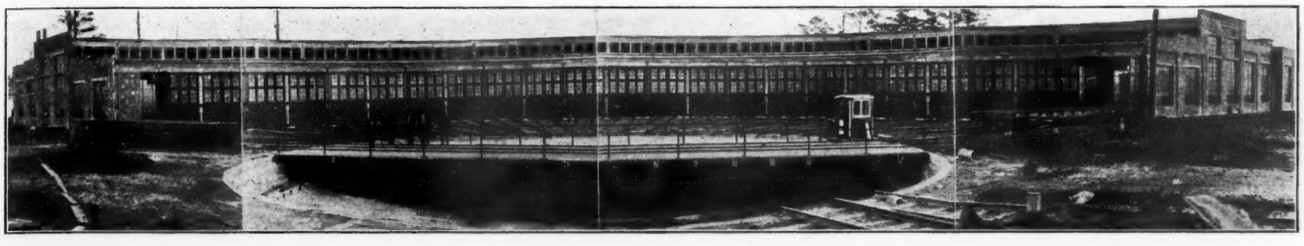
Fifteen years ago a large portion of the concrete was hand-mixed, while now almost no job is too small to justify a mixer. Today we use the cement gun, the concrete atomizer and the pneumatic mixer and placer, collapsible steel forms and concrete mixer cars. Mechanical or gravity handling of mixed concrete is a firmly established practice, and manual labor is eliminated even for supplying the materials to the mixer. One of the lessons of the Panama Canal is taught by the illustration it afforded of the possibilities for plant development when large quantities of concrete are required.

A New Terminal for the Southern at Birmingham, Ala.

This Includes a Classification Yard and Engine Facilities with Provision for Future Enlargement

To keep abreast of the rapid growth of Birmingham, Ala., the railroads running through it have been obliged to increase their passenger and freight facilities. Among these, the Southern has recently built a freight yard and engine terminal representing an expenditure of $661,000, which will be adequate to handle its business in the Birmingham district for some time to come.

The facilities of the Southern for handling freight, up to the time of this improvement, consisted of four yards scattered over a territory of approximately 10 miles, and such improvements as could have been made would have involved a large expenditure of money and would not have provided adequate facilities for any reasonable length of time. It was therefore decided to abandon all schemes for expansion of the old yards and to build a new yard on property owned by the railway at North Birmingham, Ala., to be known as "Finley Yard," in honor of the late President Finley. Plans were accordingly developed for a yard layout, taking into consideration the probable needs for a period of 25 years, with the intention, however, of building only one unit of the yard at a time and adding to it as found necessary.



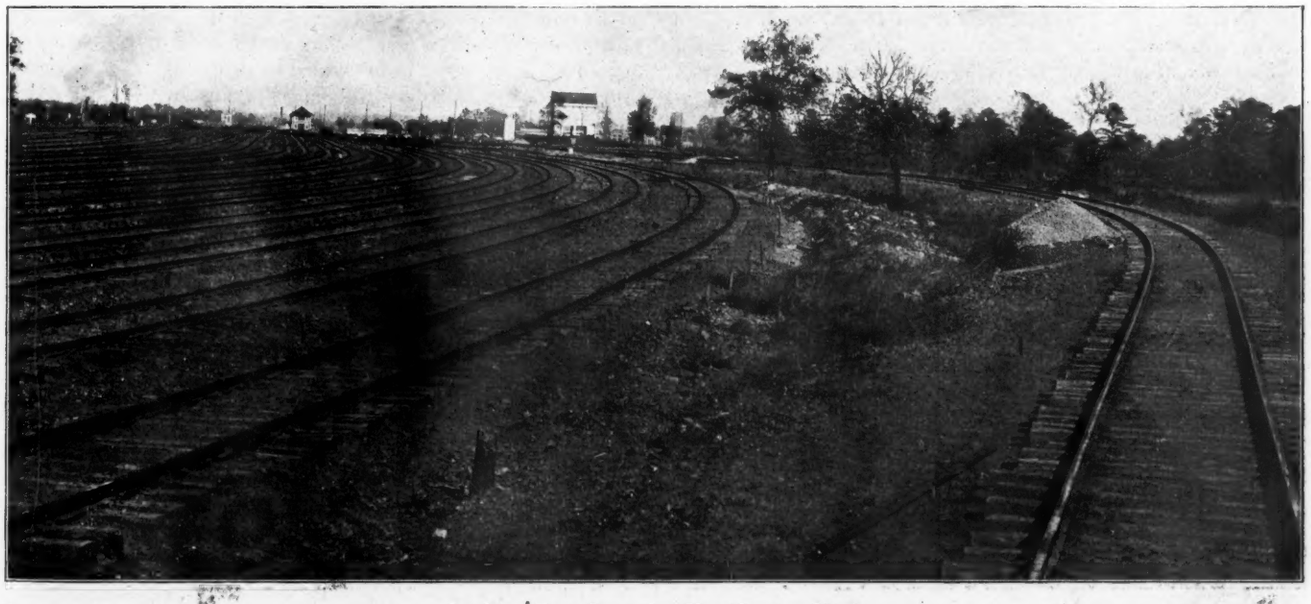
The Roundhouse and Turntable

The first unit consists of a receiving yard, a gravity classification yard and a storage and repair yard, having a combined capacity of about 2,000 cars and a complete engine terminal.

The grading for the above consisted of about 105,000 cu. yd. of earth and 1,600 cu. yd. of solid rock excavation, the cuts and fills equalizing, with the exception of 20,000 cu. yd. of borrow, obtained from the location of the future extension of the yard. Drainage is taken care of by a system of catch basins, inlets and sewers of terra cotta, cast iron and reinforced concrete pipe, ranging from 12 in. to 48 in. in diameter.

YARD ARRANGEMENT

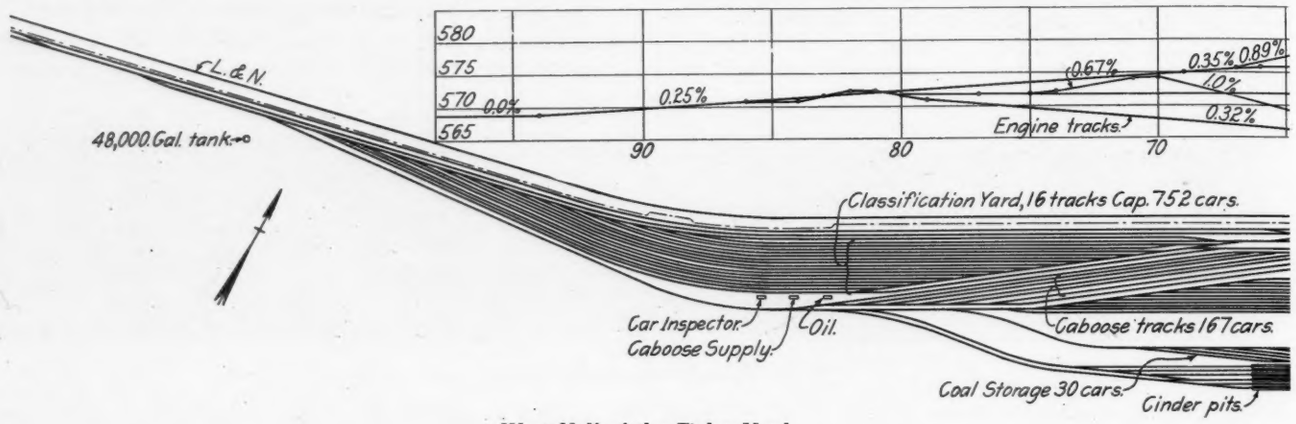
The receiving yard consists of 8 tracks, having a capacity of 45 cars each, and two running tracks; the yard tracks are laid 12 ft. 6 in. and running tracks 15 ft. between centers. The grade of the receiving yard is level for about half its length, changing to a grade of 0.5 per cent ascending in the direction of the hump. The grades for the new hump as shown on the accompanying profile were adopted after careful observation of various humps in operation at other yards and actual tests during construction; that is, when the yard was practically completed, and before it is put in operation, cars were run over the hump and the grades adjusted to meet local conditions. Commencing with the vertical curve at the apex the grade is 3.0 per cent, reducing to 0.6 per cent across the scales, a distance of 91 ft. The maximum beyond the scales is 3.8 per cent. Vertical curves were used at all grade intersections, their lengths ranging from 20 to 50 ft. There is a concrete underpass under the hump, eliminating the necessity of employees crossing the hump track while cars are being handled. A railing across the path just outside the subway at each end prevents direct passage from the subway onto the adjoining tracks, thus reducing the opportunity for accidents.



Looking East Over the Classification Yard

The classification yard consists of 16 tracks, having a capacity of 47 cars each, and two running tracks; the yard tracks are laid 12 ft. 6 in. and the running tracks 15 ft. center to center. The grade of the yard is 0.25 per cent throughout its entire length with the exception of a few hundred feet at the extreme west end which was made 0.8 per cent to coincide with the grade of the main tracks. There are 5 caboose tracks, providing for 173 cars, 2 repair tracks of 74 cars capacity, 10 local freight and storage tracks having a capacity of 530 cars each, and a 6-track coal storage yard of 35 cars capacity. The coal storage tracks are on a 1.0 per cent grade descending towards the coal hopper to permit gravity handling of the coal cars. The coal and cinder pit tracks are arranged to enable engines to take coal and water, and deposit cinders, with a minimum loss of time.

A special feature in the operation of the scale is an interlocking device for the switch at the upper end of the scale, the purpose of which is to eliminate the possibility of leaving the switch open for the passage of an engine or unnecessary switching over the scale, to prevent cars being run on the scale before the weighmaster has had ample time to put it in proper adjustment for weighing, and to place responsibility for prevalent bad practices in weighing and care of scales with one person. The main and extension levers are of cast iron, the fifth lever is of cast steel and all pivots and bearing steels are of special alloy.



West Half of the Finley Yard

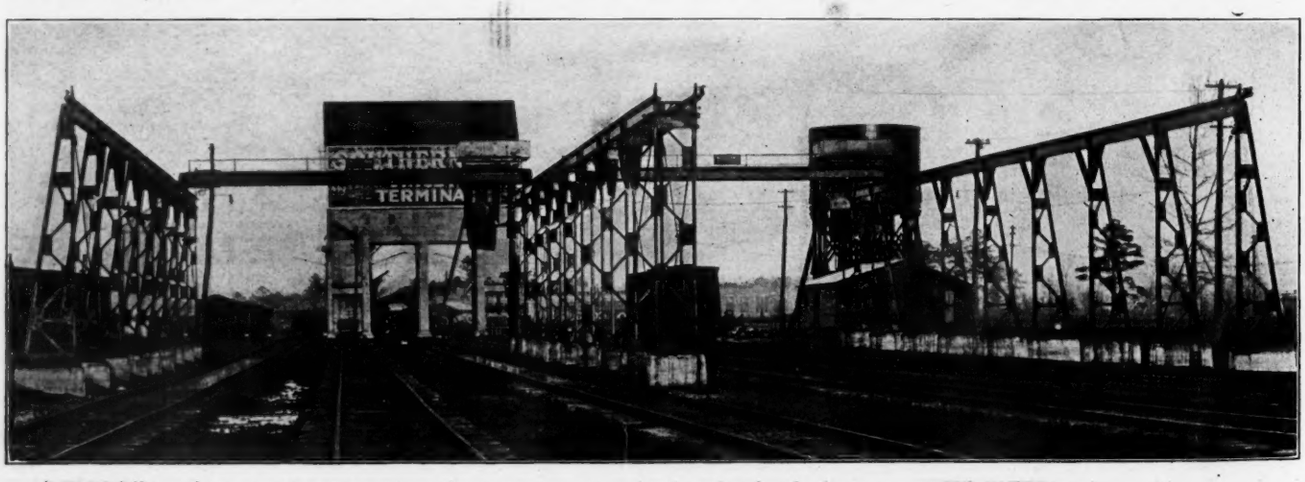
The ladders for the receiving, classification, caboose and storage yard have No. 8 manganese insert frogs. Main line and running track turnouts and crossovers and the turnouts for engine terminal tracks are nearly all equipped with No. 10 frogs.

TRACK SCALES

The track scale is of the 4-section suspension bearing type and of 150 tons capacity. It is 54 ft. long with a live weighing surface of 50 ft. and equipped with a full capacity 400-multiple beam with automatic weight recorder. The platform is designed for a dead load equal to the weight of the structure and a live load of one E-55 engine without allowance for impact, using 10,000 lb. per sq. in. unit stress in bending. The live and approach rails are connected by Bohannan-Dugger improved flexible easer joints, which prevent excessive impact and reduce the vibration of the scale mechanism. This mechanism is also protected from rain and dirt by splined and grooved timber decking and dirt shields.

The scale is installed in an open pit constructed with concrete approach abutments and two intermediate piers in each side of the scale for the support of the "dead platform." The grade over the scale is 0.6 per cent. Bethlehem steel I-beams were used in the construction of the weigh-bridge and the platform, the latter being made up of main side girders, sidewalk brackets, floor beams and stringers directly under and supporting the dead rails on malleable iron castings the thickness of the timber decking. The scale house is of special design, and, instead of the usual bay, a square front with ample window area is used which gives more satisfactory vision.

For night work the exterior lighting consists of two electric head lights so located that their rays intersect at a point 4 ft. above the rail and directly in front of the scale beams. General lighting of the scale and the upper part of the cars is furnished by a cluster of 40-watt lamps placed on the front of the scale house.



The Cinder Pits, with Craneways and Overhead Traveling Grab Buckets. Coaling Station in the Background

When trains having both weigh and non-weigh cars are switched over the hump to the classification tracks, the foreman of the crew notifies the weighmaster of the approach of a weigh car by means of a push button at the apex of the hump, which rings an electric bell in the scale house.

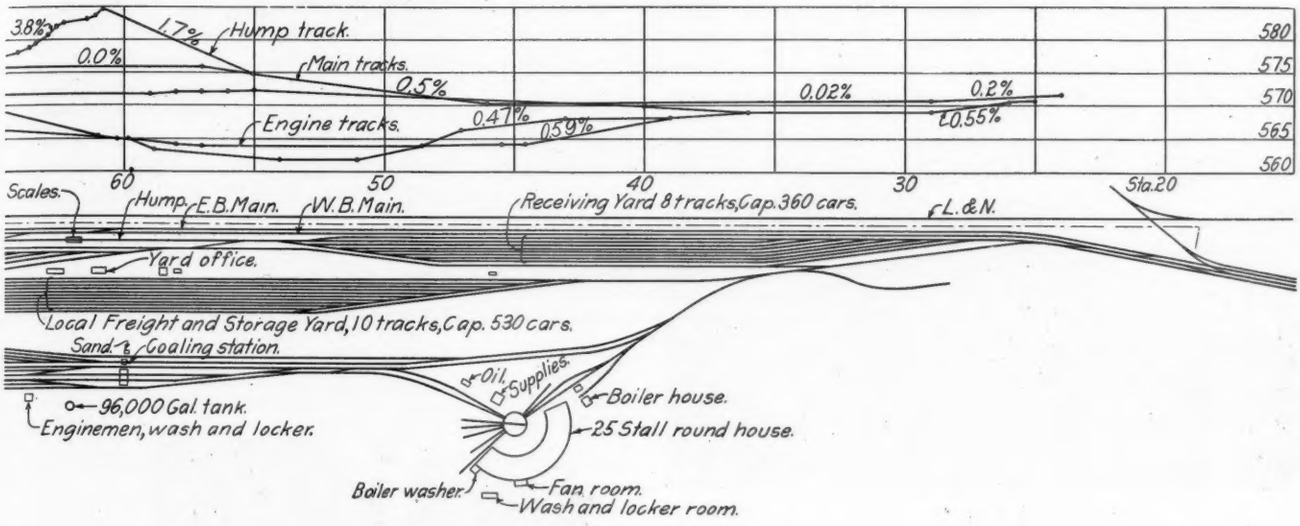
The yard office is a frame structure 25 ft. by 56 ft. with tile

roof, the first floor providing for a telegraph office, conductors' room and clerks' office; the second floor for the yardmaster's office and a record storage room.

In connection with the toilet facilities, two sewage treating plants consisting of settling tanks and intermittent slow sand filter beds were installed, one near the roundhouse, the other near the yard office.

THE ENGINE TERMINAL

The roundhouse has 25 stalls, 92 ft. long and is constructed with a concrete floor and a tar and gravel roof on a concrete slab; the rooms are equipped with lockers and other conveniences. Water for the yard and for fire protection purposes is supplied by the local water company. The railway furnished and installed all pipe lines on its right of way. Water storage sufficient for the fluctuating demand of the yard is provided by two wooden tanks, one of 96,000 gal. capacity on a 34-ft. frame and the other of 48,000 gal. capacity on a 16-ft. frame. A circulating fire protection, high pressure water main takes water directly from the local water company's pipe line.

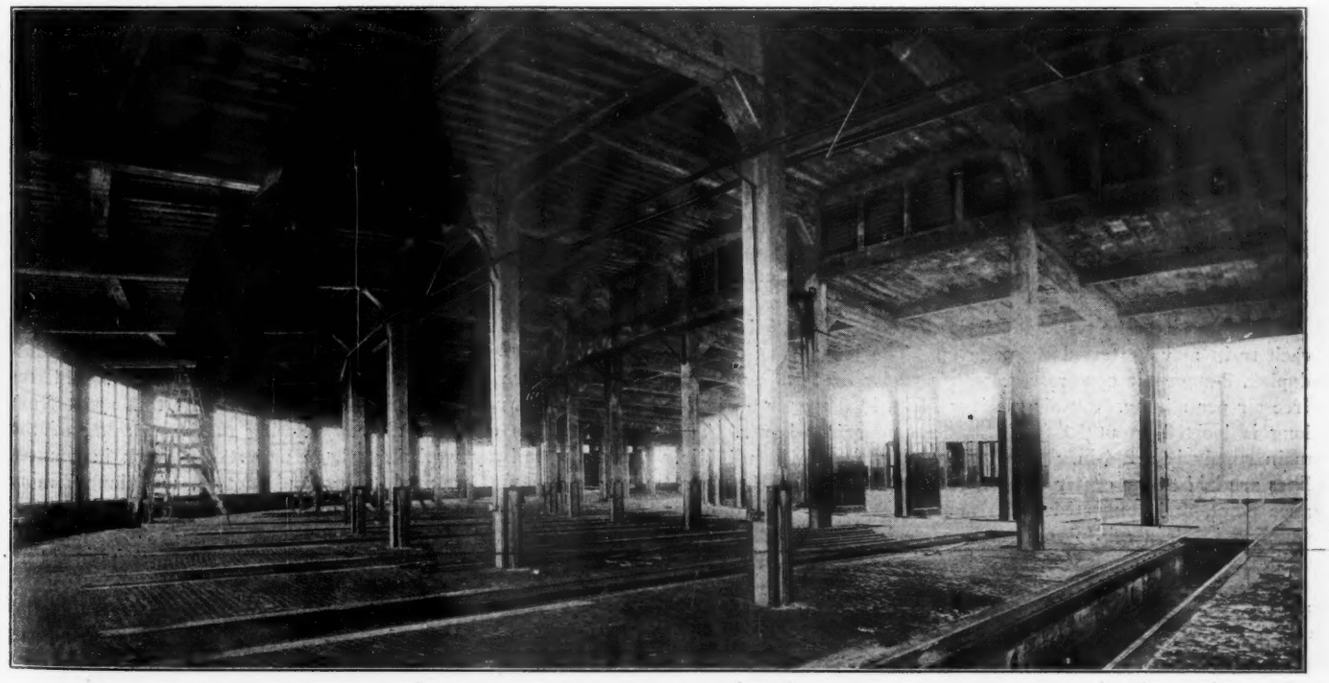


East Half of the Finley Yard

of reinforced concrete with a tar and gravel roof on a concrete and hollow tile slab. There are 25 engine pits and one truck wheel and one driving wheel drop pit. The windows are of wire glass and metal sash, each having an area of 284 sq. ft. (58 per cent of the panel area). The floor is laid with creosoted wood blocks on a 5-in. concrete base. The turntable is of the deck type, 90 ft. long, motor operated, and is installed in a concrete pit.

The wash and locker room is a brick building 23 ft. by 63 ft.

There are four cinder pits, 160 ft. long, arranged in pairs, each pair being equipped with an electrically-operated overhead traveling crane running the entire length of the pits. The cranes have a span of 46 ft. 8 in. supported by steel runways on bents 20 ft. 6 in. center to center, have an under clearance of 16 ft. over all tracks and are provided with a Brown-Hoist grab bucket of 1.5 cu. yd. capacity. The pits are of plain concrete, 4 ft. deep and 4 ft. wide, with track rails fastened to channels secured to the top of the concrete walls by U-bolts. The bottoms of the



Interior of the Roundhouse

pits are sloped for drainage and are protected from damage by the grab buckets by means of two rails embedded at the surface of the concrete.

The coal and sand handling plant is located in the center of the yard between the cinder pits and the roundhouse. The coal handling and storage facilities consist of a reinforced concrete storage pocket having an overhead capacity of 1,000 tons, of which 60 tons are held in four 15-ton scale pockets. Coal is unloaded from hopper bottom cars into a track hopper and is elevated to the top of the pocket by a motor-driven chain and bucket type elevator, from which it is discharged into the overhead storage pocket. Coal is handled from cars into the overhead pocket at the rate of about 100 tons per hour. Locomotives on any of the four tracks are supplied with coal from the scale pockets which are filled by gravity from the overhead storage.

The Track Scale and House

The scales are fitted with type registering beams which enables the operator to determine accurately the amount of coal taken by each engine.

An independent reinforced concrete sand storage and drying building is located adjacent to the coaling station. It has a capacity of 100 cu. yd. of wet sand, which is unloaded from the cars direct into a hopper, from which it is elevated to the overhead storage pocket by a motor-driven belt and bucket elevator. Three stove driers located immediately under the storage pocket are supplied with wet sand by gravity. Dry sand from the driers is delivered to a steel drum from which it is conveyed by compressed air to a storage tank located in the monitor of the coaling station, from which it flows by gravity through an outlet fixture to each of the four coaling tracks. A motor-driven air compressor is located in the sand drying room. Sand is handled into the wet bin at the rate of 35 tons per hour and is dried at the rate of about one-ton per hour.

AUXILIARY INSTALLATIONS

Elaborate air brake testing facilities have been installed so that each train may be tested as made up. The plant consists of a duplex, 2-stage air compressor, with capacity of 1,000 cu. ft. of free air per minute. An air receiver 54 in. in diameter by 12 ft. long is located about 50 ft. from the compressor house. The main supply is a 2½-in. wrought iron pipe, from which 1¼-in. lines are laid to the center of each yard track, at about the clearance point, and connected to an angle cock and standard hose coupling inside a reinforced concrete service box installed flush with the top of cross ties. Condensation reservoirs, 24 in. in diameter by 3 ft. long, equipped with drain cocks, were placed in concrete pits at the lowest points in the main pipe line. In addition to furnishing air for the brake testing facilities, the compressor also supplies air to the roundhouse.

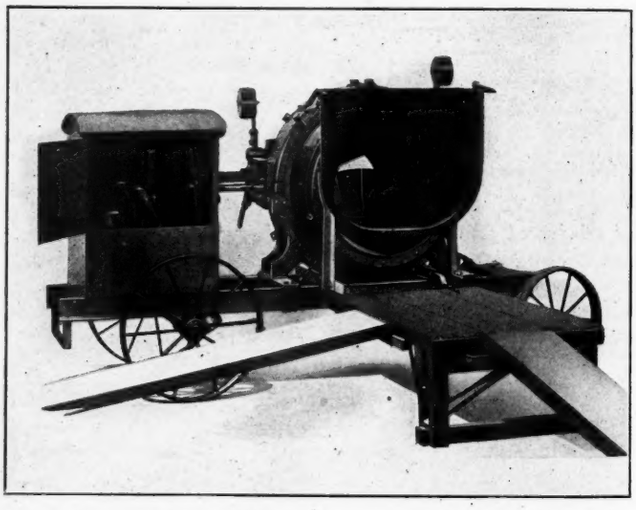
The entire yard is lighted by 400-cp. 6.6 ampere, series, nitrogen lamps, located to secure adequate light at all points of the yard. Electric lights were installed in all buildings in accordance with the best known practice, the lighting of the roundhouse having received particular attention, 100-watt mazda lamps with enameled steel reflectors are used, and about the engine pits receptacles are provided for portable lights. To supply current conveniently, a brick substation was erected to house the switchboards and duplicate 75 kw. motor generator sets. Current is purchased from a local company.

The entire terminal was built under the direction of B. Herman, chief engineer maintenance of way and structures, and T. H. Gatlin, assistant chief engineer maintenance of way and structures, to whom we are indebted for the above information.

A LOW-CHARGING CONCRETE MIXER

The T. L. Smith Company, Milwaukee, Wis., is placing a new type of low charging concrete mixer on the market to meet the demand for a machine of this kind in cases where extensive plant development is not desirable. It is built in four sizes, the smallest being the 3-ft. Low Charging Mixerette, which requires a charging platform only 18 ft. high. The other three sizes—4-ft., 6-ft. and 9-ft. mixers—are provided along the line of the standard Smith-Chicago mixers with the addition of the low charging feature.

To afford rapid charging, the feed end of the drum is left almost entirely open. A narrow hopper is added to facilitate dumping a wheelbarrow by upending. Rapid discharge is afforded by means of a steep-angle discharge chute which extends far into



The Low-Charging Mixerette from the Charging Side

the drum so that it receives the full charge of each blade. These mixers are unusually simple in design and detail and are recommended by the manufacturers, especially for the use of men inexperienced in handling concrete work.

THE SOUTH AFRICAN RAILWAYS AND THE WAR.—The report of the general manager of the South African Railways and Harbors for the year ended December 31, 1914, recently issued, contains a statement to the effect that apart from the execution of work directly relating to the working of the lines, the railway workshops have undertaken work in connection with guns, armored trains and motors, ambulance trains and cars, transport motors, condensing plants, searchlights, X-ray appliances, pontoons and many other military appliances. In fact, the railway workshops have to a certain extent served as the Woolwich Arsenal of the Defense Force. Five "armored trains" have been constructed and manned by employees of the administration; these trains were found to be of great assistance, as, in addition to the duty of patrolling the railways in areas where movement of rebels was taking place, and repairing the line where it had been damaged, they were utilized in assisting the forces in their endeavors to get into touch with the enemy. The trains were commanded by officers of the department, whose knowledge of train-working operations proved of great assistance.—*Engineering, London.*

The Development of Special Steels for Track Work*

A Résumé of the Present Status of this Increasingly Important Study and a Summary of the Results Secured

By W. C. Cushing

Chief Engineer, Maintenance of Way, Pennsylvania Lines, Southwest System

The following discussion of the present status of special alloy and special process steels was prepared originally for the International Railway Congress, which was to have been held in Berlin this year:

The different kinds of special steels in use, or undergoing trial, may be divided under two heads: Special alloy steels, and special process steels. Under the first head are included manganese, nickel, nickel-chromium, high carbon (that is, steel containing 0.75 per cent of carbon or over), and high silicon. Two or more of these have been combined, in some instances, as, for instance, high carbon with nickel and chronmium. Silicon is present in all carbon steel rails. By special process steels is meant the steel products derived from special heat treatment, or by the addition of metalloids which do not appear in the test analyses of the resulting product. Such are the so-called titanium-treated, aluminum, electric process and heat-treated steels. The object of their use has been in all cases to bring about additional safety, economy in maintenance by reducing the number of renewals, and smoother passage for trains at high speeds, over the gaps of frogs and at drawbridges.

SPECIAL ALLOY STEELS

Manganese Steel

The special steel which is now most extensively used in the United States and Canada for frogs, crossings and switch-points, outside of those built up from the usual Bessemer and open-hearth steel rails, is manganese. It is also being used experimentally in some South American countries, especially those where the railroads are under English management.

The prime characteristics of manganese steel are its very great strength, toughness and resistance to abrasive forces, and these qualities are imparted by the increase of the manganese and carbon contents in carbon steel to certain proportions which were first made known to the scientific world by the Hadfields. The manganese must lie between the limits of 8 per cent and 35 per cent. If between 7½ and 5½ per cent the alloys are extremely weak and brittle. The upper limit is partially determined by the cost of manganese metal, which is 50 cents per ton unit, when the addition is made by means of ferro-manganese. Also the high carbon content of ferro-manganese interferes with the physical properties induced by the manganese. When enough ferro- is added to make a steel with manganese 20 per cent, the carbon begins once more to dominate and a steel results which is stiff and brittle when cold, and unworkable when hot.

Ferro-manganese is a compound containing about 80 per cent of the element manganese, and is mined chiefly in Russia. It is imported into the United States from (in order of rank in 1906) India, Brazil, Russia, Cuba, Germany, Japan, Belgium, United Kingdom and Canada. The proper chemical composition, therefore, compared with Bessemer and open-hearth rail steels, in order to impart the required characteristics, has been determind to be, in percentages, within the following limits:

Kind of Steel	Manganese	Carbon	Phosphorus	Silicon	Sulphur
Manganese steel	11-13	1.0 -1.20	0.06-0.11	0.25-0.40	0.02-0.06
Bessemer steel	0.80-1.10	0.45-0.55	Not to exceed 0.10	Not to exceed 0.20	
Open-hearth steel	0.60-0.90	0.62-0.75	Not to exceed 0.04	Not to exceed 0.20	

The physical characteristics, compared with Bessemer and open-hearth rail steel, are about as follows, although it is extremely difficult to obtain specimens which are truly representative of the steel, as it cannot be cut or machined:

Kind of Steel	Tensile strength in lb. per sq. in.	Elastic limit in lb. per. sq. in.	Elongation per cent in 2 in.	Reduction of area, percentage	Hardness by	
					Brinell	Scleroscope
Manganese steel	75,000–102,000	40,000–58,000	8–27	15–29	230	40–50
Bessemer steel	89,000–126,000	44,000–62,000	5–25	5–43	172–230	29–35
Open-hearth steel	115,000–156,000	54,000–80,000	9–16	10–30	230–300	32–43
Chilled cast iron						65–75

The above results are for cast manganese steel. The figures for rolled and for forged manganese steel are higher, as shown by the following, given by W. S. Potter, the originator in the United States of rolled manganese steel for rails, in the Journal of the Western Society of Engineers, Vol. 14, 1909:

Kind of Steel	Tensile strength in lb. per sq. in.	Elastic limit in lb. per sq. in.	Elongation, per cent in 2 in.
Cast metal	82,000	45,000	30
Rolled metal	135,000	60,000	35
Forged metal	142,000	55,000	38

To impart the above physical qualities to manganese steel, and especially the great resistance to abrasive forces, special heat treatment is necessary, and it is in this heat treatment in which one manufacturer claims superiority for his product over another. It is his trade secret and is jealously guarded.

Having finally recognized the valuable qualities of manganese steel for track work, the railways found they were coupled with high cost, and therefore instituted tests or experiments to determine the matter of economy in its use. In many locations in the United States, these economics have been well established, and manganese steel is in regular use, but there are also many other places where the first cost will overbalance the economies. In all places of extremely hard service, such frogs are economical, and even absolutely necessary under present conditions, in order to avoid renewals where the traffic is so frequent that it is difficult to find an opportunity for repair work. The more difficult the place, the more economical and indispensable is manganese steel. The Cleveland, Cincinnati, Chicago & St. Louis finds in general that where frogs, switches and crossings made of Bessemer or open-hearth rail require renewal within about 20 months, it is economical to use manganese instead, and the Pennsylvania Lines place the time at 18 months. These are not scientific ways of expressing relative wear so as to be of general service to others, but are suitable only for those special cases for which the rule was determined.

The Northern Pacific states that manganese frogs will outlast open-hearth steel frogs under the same conditions by 6 to 10 times, and the Norfolk & Western from 3 to 6 times. The Lehigh Valley reports that manganese steel frogs will outlast frogs made of Bessemer steel by at least three times, the Bessemer & Lake Erie by from 3 to 15 times, and the Pennsylvania

* Abstract from Bulletin No. 177 of the American Railway Engineering Association.

Railroad by 20 times, the cost being only three times as great. This information is of service also only to those who know the conditions of service, for it is necessary to be made aware of the annual cost or saving in each case of the frogs of different kinds in order to compare them accurately. This information is difficult to obtain, but some results of trials will now be presented, the results being preceded by a table showing the relative cost of frogs and switch-points made of manganese, Bessemer and open-hearth steels about the beginning of the year 1914.

This table gives the relative cost of two distinct types of manganese frogs: The built-up, or rail-bound, frog, and the solid cast manganese steel frog. The first consists of manganese steel for the point and those parts of the wings which receive the wheel treads surrounded by pieces of Bessemer or open-hearth rail, and all bound firmly together with bolts. The second is made of a solid manganese casting without any bolts, except those necessary to join the four ends with the track rails by splice bars.

The first type is the one most generally used by the railways, although for certain locations, where the speed of traffic is slow, the second type is preferred, though of greater primary cost than the first, because it does away with the bolts. There is a certain feeling of mistrust (which may be removed later with experience) in its value for general use, because such great care is required in making the castings that defective material occasionally creeps in, and should a fracture occur, there is sometimes nothing to hold the parts together. This has been remedied in some designs by riveting the frogs to a base plate. This distrust has been expressed by the Terminal Railroad Association of St. Louis. Many frogs and crossings have been in use for the past six years, and a large number of them were of the solid cast type, but on account of having had more or less trouble with breakage, the officers in charge rather favor the inset, rail-bound or built-up work, three terms of synonymous meaning. The manganese frogs last 3 or 4 times as long as those made of ordinary rail, under those conditions.

rolled manganese rail, and are being tried by several railroads, reports of such use, but with no data, having been made only by the Hocking Valley and the Pennsylvania railroads. They have not been generally used, owing to their high cost and the waste of manganese steel when the point is sufficiently worn away to cause the discard of the whole switch. For that reason the manganese-tipped switch-points are almost universally employed where manganese steel is desired. They can readily be repaired with economy. The short points are about 3 ft. long for 18-ft. switches and 6 ft. long for 30-ft. switches, while the long ones are 6½ ft. long for 18-ft. switches, and correspondingly longer for the long ones, reaching about as far as the planing on the head of the switch-point. A record of the comparative trials of manganese and Bessemer steel switch-points has been kept by the Pennsylvania Lines, which shows that in no case has the monthly cost of the Bessemer been less than that of the manganese. In a large number of the cases the economy of the manganese points is very great, the monthly cost of Bessemer points being as high as 13 times as large.

The first attempt to apply manganese steel to rails of curves was in 1895, in the shape of flat rails for street railways, by William Wharton, Jr., & Co., Inc., and subsequently in November, 1898, 7-in. high girder guard rails were cast in about 12-ft. lengths for the Philadelphia Traction Company. In the beginning of 1902, the Wharton Company had also been approached by the Boston Elevated Railway Company on the question of manufacturing manganese steel T rails for some of the curves of its system, where an unusual condition of rapid wear existed, and in April, 1902, the first manganese steel T rails cast in 20-ft. lengths and ground to section were furnished for a curve of 82 ft. radius near the Park Street station of the Boston subway. The rails were cast straight and afterwards curved. The section was quite heavy, i. e., while the contour of the head corresponded to the 85 lb. per yd. A. S. C. E. design, the web and base were made 1⅛ in., thinning down at the ends, which were ground to a splice bar fit, and the top and side of the head were also ground smooth and true.

COST OF FROGS MADE OF MANGANESE, BESSEMER AND OPEN-HEARTH STEELS. RAILS 100 LB. PER YD; SECTION ARA-B

	Manganese					Made of Bessemer steel rails		Made of open-hearth steel rails	
	Rail-bound or built-up			Solid castings					
Number of Frog	Cost	Total weight of frog	Weight of manganese	Cost	Weight of frog	Cost	Total weight of frog	Cost	Total weight of frog
No. 8	$80–100	1,800–1,845 lb.	315– 510 lb.	$83–89	850– 950 lb.	$34–48	1,500–1,750 lb.	$36–47	1,500–1,750 lb.
No. 10	$88–102	1,900–2,000 lb.	376– 600 lb.	$100	1,110–1,150 lb.	$35–50	1,540–1,865 lb.	$37–50	1,540–1,865 lb.
No. 15	$129–147	2,400–2,800 lb.	660– 750 lb.	$131–144	1,500–1,900 lb.	$46–60	2,000–2,300 lb.	$48–61	2,000–2,300 lb.
No. 20	$166–193	3,100–3,600 lb.	855–1,110 lb.	$163–220	1,835–2,500 lb.	$57–73	2,600–2,800 lb.	$60–76	2,600–2,800 lb.
Crossings at 60-deg. angle	$480–600	6,265–8,370 lb.	2,430–2,890 lb.	$450–617	4,100–4,330 lb.	$270–384	7,630–8,555 lb.	$275–384	7,630–8,555 lb.

COST OF SWITCH-POINTS MADE OF MANGANESE, BESSEMER AND OPEN-HEARTH STEELS. RAILS 100 LB. PER YD.; SECTION ARA-B

	Manganese			Made of Bessemer steel rails		Made of open-hearth steel rails	
Length of Switch-Points.	Cost	Total weight of points and rods	Weight of manganese tips	Cost	Total weight of points and rods	Cost	Total weight of points and rods
18 ft.	$79-103	1,450-2,330 lb.	100-170 lb.	$46- 68	1,935-2,300 lb.	$48- 69	1,935-3,300 lb.
30 ft.	$114-156	2,300-3,580 lb.	142-260 lb.	$78-104	3,100-3,775 lb.	$81-105	3,100-3,775 lb.

The Pennsylvania Lines have for a long time been keeping a record of the service of manganese frogs, and manganese tipped switch-points, to determine their relative economy in comparison with frogs and switch-points made from ordinary carbon steel, and to establish some rule or guide which would be of use to the officer in charge of maintenance, and enable him to decide in advance whether or not it would be economical to order a manganese frog or switch-point for a given location. This proves that the manganese steel frogs are economical in many locations, principally where the service is severe.

In none of the cases reported are reduced dimensions attempted. It is rather the opposite. The thickness of the walls of the castings are made greater because it is difficult to make thin castings of manganese steel, and there must be no question of the strength of such costly material.

Switches are also made in the United States entirely from

Between 1905 and 1908, the successful rolling of manganese rail was accomplished by the Pennsylvania Steel Company of Steelton, Pa, and the Manganese Steel Rail Company of New York City, both of which rolled a quantity for the Boston Elevated Railway, and they were laid in the track November 4, 1908.

The price of the open-hearth rail was about $30 per ton, and of the rolled manganese rail originally $180 per ton, but now about $90 per ton. Between 1903 and 1908 several other elevated railroad companies purchased manganese steel rail for sharp curves with heavy traffic. The steam railroads have been much slower than the elevated railroads in adopting manganese steel rails because of the high cost, while at the same time their curves are not so sharp. Nevertheless, trials have been made by some of them.

The use of manganese steel rail is not well established like

that of manganese steel frogs and switches, but it is still being tried in especially difficult locations, and will in all probability meet with greater favor among railway engineers when some of the objections have been removed. The principal faults found with it at the present time are:

(1) A number of breakages have been recorded, which is disquieting. The ordinary rolled carbon steel shapes are difficult to reproduce in manganese steel, on account of the trouble in quenching the metal without the formation of minute cracks, which may subsequently cause fracture.

(2) It is strong and tough, but the hardness is not superior to that of Bessemer steel, and consequently the resistance to battering at the ends of the rails is not altogether satisfactory. Measurements to show this have been made by the Atchison, Topeka & Santa Fe. The maximum joint depression or "set" recorded up to the present time seems to be 0.10 in., after three years and two months' service.

(3) The present primary cost, about $90 per ton of 2,240 lb., is so high that, although the resistance to wheel flange abrasion on curves is greater than any other metal tried, the resulting economy is not sufficiently great to be attractive to the railways. It is hoped that additional knowledge and skill in manufacture will overcome this, because the price has already been reduced from $180 per ton. The high price was, of course, partly due to the very small quantities produced, and the lack of suitable manufacturing facilities.

(4) It is impossible to drill or cut it in the field on account of its great toughness. It is beyond the reach of present tools.

The use of manganese steel for guard rails has been introduced within the last four or five years, because of the increasing severity of the service which must be performed by a guard rail in guiding the wheels of the modern extremely heavy equipment safely past the frog point. The wearing away of a guard rail made of Bessemer or open-hearth rail is very rapid, which causes a frequent adjustment or resetting in order to make it perform its work effectively. A more resistant material will reduce the number of resettings and save labor. The relative economy of the manganese steel one-piece guard rail is now fairly well determined, but additional trials are being made, and its use is already quite large.

Nickel Steel Rail

Between 1900 and 1902 some small lots of Bessemer rail with a percentage of nickel were rolled for trial by different roads, some of which were the Pennsylvania Lines, the Baltimore & Ohio, the Bessemer & Lake Erie, the Lehigh Valley, the New York Central Lines and the Pennsylvania Railroad.

Between March and June, 1903, the Pennsylvania Lines laid 3,248 tons, or 22 miles, of nickel rail, weighing 85 lb. per yd., in comparison with Bessemer rail in curved track, some of the curves of which were as sharp as 7 deg. The two kinds were laid in alternate stretches, the change from nickel to Bessemer being made at the centre of the curve so that one-half of the curve was laid with each kind, in order to have them under the same conditions of traffic.

The average chemical composition of the two kinds of rail was as follows:

Pennsylvania Lines	Kind of Steel	Carbon	Phosphorus	Manganese	Silicon	Sulphur	Nickel
North West System..	Nickel	0.443	0.090	0.833	0.059	0.030	3.46
	Bessemer	0.498	0.093	0.850	0.105	0.039	
South West System..	Nickel	0.433	0.090	0.800	0.090	0.030	3.44
	Bessemer	0.430	0.095	0.910	0.106	0.037	

The price paid per ton for nickel rail was $54.50, and for Bessemer rail was $28, and the scrap nickel rail was to be received back at $19.60 per ton for the nickel plus whatever might be the market price for old steel rails at the time of return.

The outline or profile of the rail section was measured with a Sommer & Rauge instrument twice a year at set places in order to determine the rate of abrasion, and ultimately the comparative wear or life. At some points the nickel rail showed some slight superiority in life, but the average of all the tests pointed to the fact that the life of each, and hence the resistance to abrasion, was practically the same. The removals began in 1906, and were continued until 1911 when the last was removed, these differences being due to the differences in degree of curvature and amount of traffic. It is also necessary to compare the relative safety by keeping a record of the failures, and these are given in the table:

TABLE OF NICKEL AND BESSEMER STEEL RAIL FAILURES

Kind of Rail	System	Failures 1903	1904	1905	1906	1907	1908	1909	1910	Broken	Split heads	Crushed heads	Other defects	Total Failures	Ratio of rails laid to 1 failure
Nickel	Northwest	22	46	53	51	54	90	28	29	29	95	133	116	373	9
Bessemer	Northwest	16	34	32	40	30	22	14	2	29	53	37	71	190	18
Nickel	Southwest		6	19	16	1				4	19	19		42	86

To test the strength and ductility of the nickel steel, 48 pieces struck by a weight of 2,240 lb., falling from a height of 17 ft. 10 in., the supports for the test pieces being spaced 3 ft. apart, gave a deflection of 1½ to 2¾ in., the average being 1 15/16 in. Only one piece broke. This series of tests shows that the nickel rail cost almost twice as much as the Bessemer, lasted only about the same length of time under similar conditions, and was less strong and safe, having a very small ratio of rails laid to one failure.

The Bessemer & Lake Erie Railroad reported that the nickel steel rails tried by that company did not give satisfactory results. On the New York Central & Hudson River, 200 tons of nickel rail, 80 lb. per yard, were laid in 1903, and 100 tons of 100 lb. per yard in 1905. Both lots were Bessemer steel with 0.40 to 0.50 carbon and 3½ per cent nickel. The 80-lb. rails after a short time of service commenced to flow laterally on the curves, and large flakes were detached from the heads, though the loss of metal did not take place quite so rapidly as in the case of the plain Bessemer rails laid with them for comparison. The flow from the heads of the 100-lb. rails was rapid, great slivers being detached on the curves after a few months' service.

Nickel-Chromium Steel Rail

The next step was to add chromium, a hardener, to the nickel steel rail. The nickel-chromium rail was of the usual open-hearth steel with 2½ per cent nickel and 0.50 to 0.90 per cent chromium, and the comparisons were made with ordinary open-hearth rails and with Bessemer steel rails in addition. The hardening effect of the chromium was clearly evident in the diagrams of all the tests, as well as the inferiority of the Bessemer rail to either of the others. In the case of the outside or high rails the abrasion of the open-hearth rail was 10, 13, 35, 38 and 55 per cent greater in the different tests than the nickel-chromium alloy; and in the case of the inside or low rails the abrasion of the open-hearth rails was 14, 22, 37, 58 and 62 per cent greater.

There were 20 rails of each kind in the test, on a 9-deg. 20-min. curve. Five nickel-chromium and no open-hearth rails broke, while 1 nickel-chromium and 4 open-hearth rails had crushed heads. This shows that the greater resistance to abrasion of the nickel-chromium rail is at the expense of greater brittleness. In another test with 16 rails of each kind, on a 7-deg. 32-min. curve, 5 of the nickel-chromium rails broke and one had a split head, while none of the open-hearth rails failed. All of the tests showed that for greater resistance to the forces of the abrasive action of wheels the addition of nickel and chromium to open-hearth steel rails in the quantities and in the manner used is very desirable, but is undesirable on the score of safety. Similar unsatisfactory service has been given by nickel-

chromium rail on the Central Railroad of New Jersey, where the breakages were 1 in 20 rails laid, and on the Erie, where they were 1 in 78 rails laid. On the Lehigh Valley the results of trials were the same in regard to failures, but the rate of abrasion was slower than for ordinary steel under the same conditions, the difference being as high as 70 per cent in some cases. The composition of the rails was carbon 0.50 to 0.60, phosphorus not over 0.04, manganese 0.60 to 0.90, nickel 2.0, chromium 0.4 to 0.75 per cent.

High Carbon Steel Rail

The only road which sent in any information about high-carbon steel rails was the Pennsylvania Lines. These rails have given excellent service from the standpoint of resistance to the abrasive action of wheels, lasting more than twice as long as ordinary Bessemer and open-hearth rail, under similar conditions of traffic, but have developed serious fault from the standpoint of safety, as the breakages have been numerous, 1 in 14 rails laid, and, most alarming of all, the silvery oval spot, called the "transverse fissure," has been found in the head. The carbon was very high for rail weighing 85 lb. per yard, from 0.80 to 0.88 per cent, and in addition nickel and chromium were present, making a very hard and brittle material, and it is not known what the effect might be in the case of rails of heavier section. It is customary to increase the percentage of carbon in the heavier rails. It is evident that the proportions used in the 85-lb. section were too high.

SPECIAL PROCESS STEELS

It has come to be fully recognized by American railway engineers that sound ingots are essential for the production of sound rails, and, although nearly all railways are opposed to interference in the processes of manufacture, believing instead in the principle of specifications for rails which set forth clearly and concisely the physical qualities which they must have, and the methods of conducting tests which will prove that the product offered for sale does or does not posses those qualities, nevertheless, it is the universal practice in the United States and Canada to specify the chemical constituents as well, and a few introduce other clauses relating to mill practice, such as holding in the ladle for a specified time, size of teeming nozzle, length of ingots, etc. While such requirements have generally been excluded from specifications, yet the subject of mill practice has been and is being widely studied by railway engineers.

Bradley Stoughton has admirably summed up our available information on ingot defects. These defects are phosphorus, which has been mastered in the open-hearth steel process, slag inclusions (sub-divided into solid oxidized enclosures and entrained sulphides), blowholes, combined gases, pipes and segregation. The purpose of the addition of aluminum, silicon, ferro-titanium, vanadium and other "physics" or "cleansers," is to remove as many of the defects enumerated as possible. In doing this, aluminum and titanium pass off with the impurities and leave no trace behind in the finished rail.

Titanium

The results of the trials of titanium-treated steel rails have been conflicting up to the present time, owing, perhaps, to the fact that the variables in the tests have been too numerous. In order to obtain accurate information, there should be but one variable, the treatment with ferro-titanium. The conditions in the cases of the Delaware & Hudson and the Lehigh Valley tests were not the same, and it is impossible to say to what extent the sharper curvature for the titanium-treated rail offsets the greater power of resistance to abrasion due to the higher carbon content in it. In the case of the Northern Pacific the results are reported not good on account of the higher percentage of piped rails which shows the necessity for an improved method of making sound ingots or an additional discard. The trials of the two kinds of rails are not exactly comparable, with reference to the titanium treatment, because titanium-treated Bessemer steel, with its lower carbon and high phosphorus, is compared with open-hearth steel with its higher carbon and low phosphorus. In the Rock Island trials, the advantage seems to lie with the titanium-treated Bessemer rail over open-hearth and electric-process rail during 17 months' service.

Neither the Maine Central, the Terminal Railroad Association of St. Louis, the Chicago Great Western nor the Delaware, Lackawanna & Western found any appreciable difference in resistance to abrasion by the use of ferro-titanium, but the results on the Boston & Maine were quite favorable to it. The Baltimore & Ohio tests exhibit superiority in resistance against the abrasive action of wheels of titanium-treated Bessemer rail over ordinary Bessemer rail of practically the same composition, but in the case of open-hearth rail, with its higher carbon, the superiority is lost. Of course, the comparison would be fairer if open-hearth steel of the same composition had been treated with titanium.

The principal value of ferro-titanium is in helping to produce solid ingot metal, and that is, of course, a splendid quality. Its tendency to produce a deeper pipe must be counteracted by a greater discard or an improved method for making the top of the ingot sound. It leaves no trace of itself in the resulting metal, and therefore does not make an alloy steel with any greater resistance to abrasion, or any greater strength, than is brought about by its less spongy condition and greater compactness.

Aluminum

Aluminum is used in their daily practice by many of the rail manufacturers at their mills, but its use has not been specifically requested by any railroad administrations for special tests, but, on the contrary, is entirely prohibited in the specifications of some railroad administrations.

High Silicon

Although trials have been made in limited quantities of steel rails high in silicon, that is, over 0.30 per cent, but little information has been furnished to the reporter. On an 8-deg. curve at Hoblitzell, on the Baltimore & Ohio, some rail with carbon 0.596, phosphorus 0.10, manganese 1.11 and silicon 0.69 was tried, but it was too brittle, as 7 out of 8 rails failed. Other tests are now being conducted by other roads.

Electric Process

A few railways are trying small quantities of rail manufactured by this process at the Heroult furnace of the Illinois Steel Company at South Chicago. The Terminal Railroad Association of St. Louis reports that limited experience indicates that it has better resistance to abrasion than ordinary Bessemer steel, and the Lake Shore & Michigan Southern reports that the Electric Process shows less abrasion than the Bessemer. The Rock Island Lines put 287 tons of 100-lb. rail in service and state that after 17 months' service the number of square inches worn off the head was less for the electric process than for the open-hearth, but greater than for the titanium-treated rail. There were no failures of the titanium-treated or of the electric process, while there was 1 failure in 1,008 rails laid of the open hearth.

Heat-Treated Rails

The Carnegie Steel Company is conducting an investigation into the performance of oil-quenched rails and is making service tests on the Union Railroad of Pittsburgh. A number of open-hearth rails of 100-lb. A. R. A. Type B (Fig. 14) section were rolled and treated in April, 1912, and were placed in track June 10 and 11, 1912, on the high and low sides of a 5-deg. curve, about 3½ miles from East Pittsburgh. As far as the profiles and inspections show up to July 1, 1913, the oil-quenched rails show an average improvement of 41 per cent over the untreated rails on the high side of curve, and about 37 per cent improvement on the low side of curve, or an average of 39 per cent for the oil-quenched rails over the untreated rails under exactly the same conditions of service.

Other steel companies are also making experiments with heat-treated rails in order to raise the elastic limit without sacrificing ductility, and the Pennsylvania Steel Company has recently rolled 16 rails of special section, approximating 121 lb. per yard, which are to be laid for service test in the tracks of the Pennsylvania Railroad, where the curvature is sharp and the traffic heavy. The Pennsylvania Steel Company manufactures rail from Cuban iron ore, known as Mayari ore, which naturally contains a small amount of nickel and chromium, and it has been found that this steel when heat-treated possesses the qualities of extreme hardness unaccompanied by brittleness, but it is difficult to heat-treat an unbalanced section like a rail without distorting it, and at a reasonable cost.

Conclusions

1. Cast manganese steel has been proved by long experience, under exacting conditions, to be a satisfactory and safe metal for the manufacture of frogs and switch-points.

2. The trials of rolled manganese steel for rails, and for the manufacture of frogs and switches have not been so extensive as with the cast product, but have been continued to a sufficient degree to enable us to conclude that it will ultimately be entirely suitable for those uses at locations where great strength, toughness and a maximum abrasive resistance are desirable.

3. The experiments with nickel, and nickel and chromium in certain proportions, in rail steel have not, up to the present time, been entirely satisfactory; but the accepted employment of nickel steel in bridge construction, and the trials of nickel and chromium in other proportions in rail steel, especially when incorporated as two of the natural elements of the iron ore, justify continued use.

4. The use of high carbon (over 0.80 per cent) in rails weighing 85 lb. per yard, in combination with 0.92 to 1.00 per cent of nickel, and 0.24 to 0.29 per cent of chromium, has not been satisfactory. The conditions with rail sections of greater weight might be entirely different.

5. Further study of the qualities possessed by high silicon rails, that is, steel with over 0.30 per cent of silicon, is advisable.

6. The value of the use of ferro-titanium in rail steel manufacture as a "physic" for improving the condition of solidity of the metal is conceded, but at the same time steps should be taken to overcome its injurious effect in deepening the "pipe" in the ingot.

7. Heat-treated rails, and those manufactured with the assistance of the electric process are at present in experimental use only, but the possibility of future value is promising, and the study should be continued.

ABSTRACT OF ENGINEERING ARTICLES

The following articles of special interest to engineers and maintenance of way men, to which readers of this section may wish to refer, have appeared in the *Railway Age Gazette* since September 17, 1915:

Grade Crossing Elimination in North Toronto, Ont.—The Canadian Pacific is completing the elevation of its tracks in North Toronto for a distance of 2½ miles, this work also involving the building of a new passenger station at North Toronto. This project was described in an illustrated article in the issue of September 24, page 555.

The First Bridge Built in War Time.—That construction activities have not entirely ceased in those European countries engaged in war is evidenced by the recent completion of a cantilever bridge across the Seine at Rouen, with a total length of 1,065 ft. This bridge was described in a short illustrated article in the issue of September 24, page 564.

Recent Progress in the Federal Valuation Work.—The field forces engaged in federal valuation work are now covering about 4,000 miles of line per month. Recent developments in the methods adopted by the government forces and by the carriers to secure the desired information, were described in an article in the issue of September 24, page 569.

International Engineering Congress at San Francisco.—Five sessions of the International Engineering Congress, held in San Francisco, September 20-25, were devoted to railway engineering and papers were presented by men prominent in the various branches of railway operation and maintenance in this and foreign countries. These papers were abstracted in the issue of October 1, page 599.

Grade Crossing Elimination.—An editorial describing the relation between the expenditures for the elimination of grade crossings and the number of persons killed and injured in Chicago was published in the issue of October 8, page 634.

Interstate Commerce Commission Hearing on Valuation.—On September 30 and October 1 the Interstate Commerce Commission heard oral arguments by representatives of the railways on important considerations regarding the federal valuation. The arguments presented at this time were abstracted in the issue of October 8, page 651.

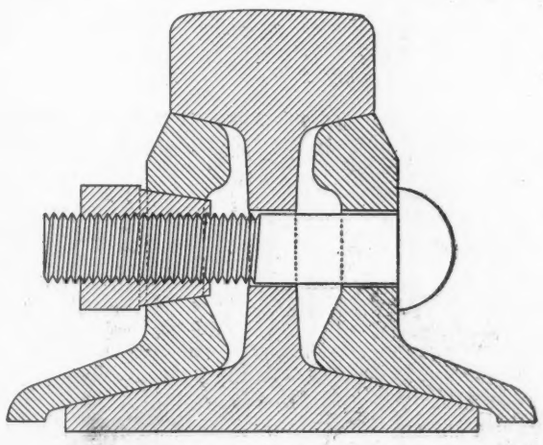
Pennsylvania Track Elevation Through Wilkinsburg, Pa.—The Pennsylvania is now completing the elevation of its main line through Wilkinsburg, a suburb of Pittsburgh. This work involves a number of interesting construction problems, which were described in the issue of October 8, page 654.

Electrification of 440.5 Miles of the St. Paul.—The Chicago, Milwaukee & St. Paul is now completing the electrification of the first of four engine districts between Harlowton, Mont., and Avery, Idaho, and is actively engaged on the remaining three. The details of this work were described in an illustrated article in the issue of October 15, page 683.

Valuation Methods on the Big Four.—To secure the information required by the federal valuation parties, the large roads now under valuation have organized special departments. The character of the organization developed on the Big Four, on which work has been under way for a year, was described in the issue of October 15, page 701.

A NEW BOLT NUT FOR RAIL JOINTS

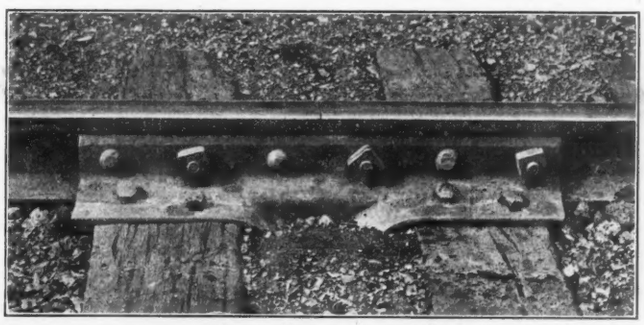
The Ballou safety rail bolt nut is the name of a new nut recently put on the market for use with rail joints. The nut is provided with a conical or tapered extension which fits into the bolt hole in the splice bar. This bolt hole is also given a



The Ballou Safety Rail Bolt Nut

conical taper of such size that when the bolt is drawn up the tapered shank of the bolt comes to a secure bearing in the tapered hole without allowing the shoulder of the nut to bear against the face of the splice bar.

Joints equipped with these nuts have been used experimentally on 27 railroads and several street car systems, in some cases



An Application of the Ballou Bolt Nuts to a Depending Flange Joint on the Norfolk & Western

for a period of two years or more. These tests have shown that the frictional resistance of the taper bearing is sufficient to prevent the loosening of the bolts by the ordinary vibration and movement of the tracks under traffic. The axial elongation of the nut serves to strengthen the threaded connection of the bolt to the nut, it shortens the length of the bolt between the

head and the nut and it protects the thread on the bolt from frictional wear and exposure to the weather.

A joint of the angle bar pattern designed for use with bolt nuts of this type is now on the market under the name Ballou safety rail joint, but bolts equipped with the Ballou nut may be applied to any form of joint. An accompanying photograph shows an example of such an application, which follows the ordinary practice of alternating the nuts on the inside and outside of the rail. There is no restriction upon the length of bolts with which these nuts may be used, and in consequence, the nuts are equally applicable to frogs and crossings. This joint is manufactured by the Ballou Safety Rail Joint Company, Roanoke, Va.

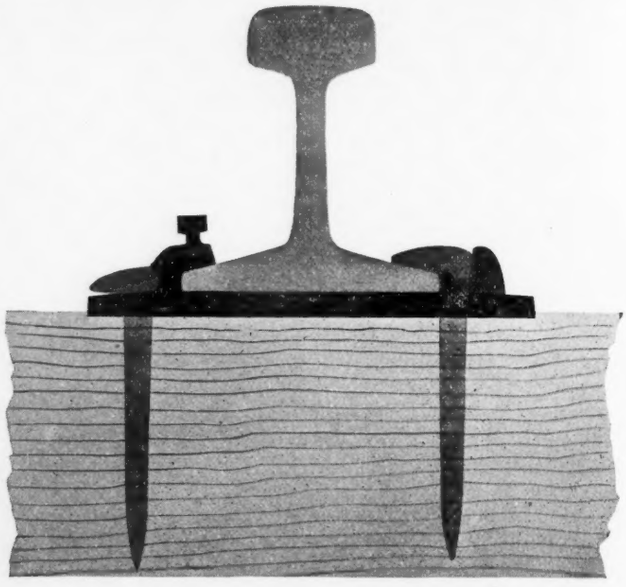
THE THOMAS RAIL ANCHOR TIE PLATE

As its name indicates, the Thomas rail anchor tie plate is a tie plate and rail anchor combined. It consists of a malleable iron tie plate with slight corrugations on the bottom and with shoulders on both sides. The plate can be made of any thickness and size desired to conform to the standards of any road. The special features of this design are the means by which it is locked to the rail, eliminating movement between the rail and tie plate. To accomplish this the shoulder on one side is extended up over the flange of the rail 5/8 in. The lower surface of this extension is inclined to the same angle as the upper surface of the rail flange, providing a drive fit. A set screw of cast

An Installation of Thomas Rail Anchor Tie Plates at Kansas City, Mo.

hardened steel also extends through this extension, engaging the rail. This screw is inclined at right angles to the upper surface of the rail flange, giving it a full, firm contact. Two set screws have been provided on some patterns of this plate, although it is not believed that this is necessary in most cases. On the opposite side of the rail, lugs are provided behind the spike holes, forcing the spikes to their proper position against the rail, and holding them there, thus securing contact with the rail on both sides. With this device the track is anchored against movement in both directions without the use of any additional devices and by making the rail, tie plate and tie a unit, expansion is confined to each individual rail. By reversing the plates on alternate ties, the rail is given increased resistance against overturning.

These tie plates have been in service experimentally for periods up to two years under very severe conditions. One of the earliest installations was made on the Kansas City Terminal two years ago on a track on a heavy grade between the roundhouse and the station. While this track was not subjected to heavy trains, there is an almost continued movement of engines over it. Another test has been under observation since February 1, 1915, in the main tracks of the Chicago, Burlington & Quincy near Canal and Sixteenth Streets, Chicago. These tracks are on a heavy descending grade with about 300 movements per day over them, the large majority of which are heavy passenger and switching trains. Although this track has been especially difficult to maintain previously, both with reference to creeping and to spreading, neither of these tendencies has been evident since the installation of these plates. A similar installation was made at the same time on the main tracks of the St. Paul at Western Avenue, Chicago, where these plates replaced tie bars, rail anchors, rail braces and tie plates and which has proved equally satisfactory. Other installations have been made on the



A Section of the Thomas Rail Anchor Tie Plate, Showing Its Relation to the Rail and Tie

Chicago Great Western and on the Chicago & North Western at points of heavy grades and soft embankments where the rail was inclined to run. In all of these installations this plate has been effective as an anchor as well as a tie plate.

The Thomas Rail Anchor Tie Plate is made by the Chicago Malleable Castings Company, West Pullman, Chicago, Ill.

EFFECT OF TREATMENT ON THE STRENGTH OF BRIDGE STRINGERS

The United States Department of Agriculture, Forest Service, has made public, in Bulletin No. 286, the results of a number of tests made in co-operation with the Illinois Central and one eastern and two western wood-preserving companies, to determine the effect of commercial creosote treatment on the strength of loblolly pine, long leaf pine and Douglas fir bridge stringers. The timbers were selected for test from stock furnished by the co-operators and they received the regular commercial treatment. The test specimens were 8 in. by 16 in. in section and from 28 to 32 ft. in length, each stick being cut into two stringers of equal length at the time of treatment. Based on these tests the following conclusions were drawn:

(1) Timber may be very materially weakened by preservative processes.

(2) Creosote in itself does not appear to weaken timber.

(3) A preservative process which will seriously injure one timber may have little or no effect on the strength of another.

(4) A comparison of the effect of a preservative process on the strength of different species should not be made, unless it is the common or best adapted process for all the species compared.

(5) The same treatment given to a timber of a particular species may have a different effect upon different pieces of that species, depending upon the form of the timber used, its size, and its condition when treated.

Convention of the Bridge & Building Association

Abstract of the Committee Reports and Discussions at the Twenty-Fifth Annual Meeting Held at Detroit

The twenty-fifth annual convention of the American Railway Bridge & Building Association was held at the Statler Hotel, Detroit, October 19-21, inclusive. About 175 members of the association were present, including a considerable number of the past-presidents and older members. A special feature of this convention, marking the twenty-fifth anniversary of its organization, was the attention paid to the earlier work of the association and to a review of its development.

This convention was the most successful in the history of the organization in point of attendance, character of committee reports and discussion. The officers for the past year were: president, L. D. Hadwen, Chicago, Milwaukee & St. Paul; first vice-president, G. Aldrich, New York, New Haven & Hartford; second vice-president, G. W. Rear, Southern Pacific; third vice-president, C. E. Smith, Missouri Pacific; fourth vice-president, E. B. Ashby, Lehigh Valley; secretary, C. A. Lichty, Chicago & Northwestern; and treasurer, F. E. Weise, Chicago, Milwaukee & St. Paul.

The convention was opened with prayer by Past President J. N. Penwell (L. E. & W.), Mayor Marx of Detroit, and J. C. Bills, assistant general solicitor of the Pere Marquette, welcomed the association. Vice-President G. W. Rear (S. P.) and Past President W. A. McGonagle (D. M. & N.) responded for the association. In his presidential address L. D. Hadwen traced the development of bridge design and maintenance during the 25 years since the association was founded, citing the change from Coopers E. 35 to Coopers E. 55 loading, or heavier; the replacement of wrought iron with steel, and more recently with alloy steels; the substitution of concrete for stone, etc.

The report of the secretary showed 95 new members received during the year and a total membership of 664. The treasurer's report showed a balance on hand of $1,200.

Committee reports were presented on The Use of Locomotive Cranes; Pile and Timber Trestle Bridges; Railway Water Tanks; Costs of Structures; Warnings for Overhead and Side Obstructions; Reinforced Concrete Bridge Work; Concrete Culvert Pipe and Concrete Piles, and Street Crossing Gates, Towers, Bells, etc. Monographs were also presented on the subjects of Manila Rope by F. E. Weise, chief clerk, engineering department, Chicago, Milwaukee & St. Paul, and on Water Waste by C. R. Knowles, general foreman, water service, Illinois Central.

LOCOMOTIVE CRANES

The entire development of the locomotive crane has taken place within the last 25 years. It was designed to fill the demand for a portable crane that could be moved from place to place around an industrial plant. The first locomotive cranes were of two to five tons capacity with short booms of about 15-ft. radius. They were mounted on short car bodies supported by four small car wheels, and the propelling gear consisted of sprockets and chains. The first real improvement was the adoption of gearing for propulsion, and this feature has now been developed to such an extent that cranes have been built capable of hauling several cars at 20 miles per hour.

The four-wheel car was used exclusively for several years and cranes of 10 and 15 tons capacity were built. These cranes could not be hauled in trains, even at slow speeds, and the need of a crane that could be transported readily led to the adoption of the eight-wheel car about ten years ago, which has permitted increasing the capacity to a maximum of 60 tons. The greatest handicap in the development of cranes is the fixed width of gage, which makes it necessary to have a heavy car and sufficient counterweight to prevent overturning when loads are lifted at right angles to the track. Even with all the weight that can be applied conveniently, the cranes have their full capacity only at short radius. The use of outriggers, which are provided on the larger cranes, increases the width of the base and adds to the stability at right angles to the track. They should be used on both sides of the crane when handling heavy loads on poor track, as the breaking of the hoisting cable or the slipping of the hitch may cause the crane to tip over backwards.

A modern locomotive crane in capable hands can be used for an endless variety of work. No railroad is so small that one or more can not be kept busy, nor is it necessary to use them every day to make them economical.

USES OF LOCOMOTIVE CRANES

In almost all cases a locomotive crane can switch the cars that it loads and unloads, doing away with the necessity of having the cars "spotted" with a locomotive. Within its capacity a crane will do all kinds of hoisting either with one or two lines, and with a long boom, or extension of a short boom, it can place loads high above it. As a crane can swing its boom through a complete circle and the radius can be varied, loads can be picked up and placed anywhere within its radius. A double-drum crane can operate any two-line clam-shell or orange-peel bucket. When a locomotive crane is equipped with an electric generator and magnet, it will handle all kinds of metal. A leader truss with regular pile driver leaders has been designed to take the place of the boom on the larger sizes of cranes. This arrangement makes a pile driver more capable of doing work than a regular driver. A locomotive crane will switch the cars, unload the material, drive the coffer-dam, make the excavation, drive the foundation piles, handle concrete material, tear out the old structure, erect the new one, and clean up and load the remaining material without the assistance of any other machine and with very few men. In a storage yard a locomotive crane will switch the cars, will load, unload and pile material of all kinds, and will pile it higher than is economical by hand. In a ballast pit it will make a good showing loading ballast, especially if the excavation is below the water line. On the road it is of great value picking up freight that may have fallen from cars. It will pick up and place rip-rap, and will load and unload lumber, rails or any other heavy material.

Cranes are built in sizes ranging from 3 to 60 tons capacity; the lightest ones being used chiefly around industrial plants and the larger ones for special purposes, such as bridge erection. The best crane for maintenance of way work is the eight-wheel crane of 20 to 30 tons capacity. Such a crane will cost from $7,000 to $8,000. The cost of operation depends on the number of days worked, the kind of work, etc., it being evident that a crane loading ballast will require more repairs than one doing light work in a storage yard. However, the average cost of operation will be about as follows:

Interest	$2.00
Depreciation	2.00
Repairs	2.00
Fuel	2.50
Supplies	.50
Labor	6.00
Total	$15.00

This is somewhat higher than is usually claimed, but is probably a fair estimate. Where fuel is cheap and wages low, it may be reduced somewhat, but it is usual to underestimate such items as depreciation and repairs. Depreciation and repairs have been figured on the basis of 20 years' service, but that in the meantime it will have been completely rebuilt once. The daily rate is based on 200 full service days during the year. It is when the use of a crane is compared with manual labor that its great saving is shown. Figures have been obtained from a large number of sources and while they show considerable variation in

general it may be claimed that a crane will save as against hand work as follows:

Handling scrap, etc., with a magnet	$40 day
Handling coal, etc., with a clam shell bucket	40 "
Handling lumber and timber	30 "
General construction work including switching	40 "

A few comparative costs selected at random, follow:

Material Handled.	Unit.	By Hand.	With Crane.
Scrap	Ton	$0.20 to $0.25	$0.02 to $0.06
Coal	Ton		0.05 to 0.10
Timber	M. ft.	0.40 to 0.50	0.12 to 0.20
Lumber	M. ft.	0.40 to 0.50	0.25 to 0.35
Piling	Lin. ft.	0.004	0.002
C. I. Pipe (Loading)	Cwt.	0.032	0.016
C. I. Pipe (Unloading)	Cwt.	0.021	0.012

GENERAL CONSIDERATIONS

The wheels, axles, journals, boxes, brasses, etc., should be of the standard used by the railroad purchasing the crane, so that repairs to the running gear can be made quickly. The car should be built of steel and of such length that the boiler end of the crane will not extend beyond the end of the car, thus permitting the car to be coupled into the train without removing any parts of the crane, except the boom, which may be carried on an idler flat car. The car should also be long enough (about 24 ft.) to give it riding qualities necessary for handling in ordinary freight trains. At least one truck should be of the standard swivel 4-wheel type.

The propelling gear should be designed to propel the crane and whatever cars it will pull at the rate of four to six miles per hour. Provisions should be made to throw out of gear without the removal of collars or other fastenings under the car, and this feature should be handled entirely by levers or hand wheels at the side of the car or on top. The car should be provided with standard draft rigging and brakes. It is a great advantage to have an air pump and engineer's valve on the crane itself, but this feature is not absolutely essential.

The boom should not be too long except for special service, the ideal length being from 30 to 40 ft. The boom hoist should be of ample capacity and should be operated with a worm gear of such pitch as to require power to operate it in either direction. The A-frame should be of such design and material as to withstand shocks without cracking and should be rigid enough to keep the engine and gears in proper alinement. As far as possible the design of the engine and gears should be such as to permit the removal of any shaft, gear, etc., without having to remove other gears and shafts. The reversible engine is favored by all who use it. Experiences of 15 years with hundreds of machines have proven that there are no objections to a reversible engine and its advantages in lowering a heavy load are enough to overcome any disadvantage.

There should be two drums, so that two-line buckets can be operated. One of these drums should be the main hoist for heavy loads and the other may be an auxiliary drum of lighter capacity to operate the holding line of the bucket, but both should be power operated. An automatic tag-line or take-up device should be furnished to handle the tag-line of the bucket. The operating levers should be in such a position as to give the engineer the best view of what he is doing. The engineer should also have ready access to the boiler compartment, so that he can fire the crane when the class of service will permit without inconvenience.

The boiler is the real limiting feature of the machine. It should be of proper size, well insulated and designed for hard service. It should be a free steamer and economy of fuel should be sacrificed if necessary to provide the maximum amount of steam. Reference to the cost of operating tables will show that the cost of fuel is a small percentage of the total cost and the results obtained are so great that extreme economy is not of importance. Fuel and water should be carried in the greatest quantities for which space can be found.

Probably the most important feature is the fastening of the crane to the car. The up-lift on the center hold-down apparatus, or king pin, is great, and subject to shocks, and in case of breakage there is nothing to prevent the crane from overturning off the car. The sliding I-beam out-riggers are to be preferred over the bracket type on the side of the car. They should be located as low as possible so as not to require much blocking. Jack-screws for the out-riggers are not necessary.

An efficient device should be provided to take the load off the truck springs. This should be of such design that the crane will ride properly if this device is not removed before the crane is put into a train.

The capacity of the crane at different radii should be plainly marked. An automatic indicator which will indicate the capacity at any position of the boom is simple and should be on every crane.

G. W. Rear, chairman, S. P.; A. T. Mercier, S. P.; D. E. Plank, Pac. Elec.; D. A. Shope, A. T. & S. F.; W. O. Eggleston, Erie; E. T. Howson, *Railway Age Gazette;* G. H. Stewart, B. R. & P.; E. B. Ashby, L. V., committee.

Discussion.—The versatility of locomotive cranes for railway work was emphasized. R. H. Reid (N. Y. C.) uses locomotive cranes in erecting bridge spans, for placing concrete culvert pipe and for similar work at a greatly reduced cost.

G. S. Robinson (C. & N. W.) has unloaded up to 20 cars of coal per day at a cost as low as six cents per ton. The crane was not so successful in unloading rubbish, and could only unload eight tons per day. W. O. Eggleston (Erie), has erected a number of overhead highway bridges with a locomotive crane at a saving of 50 per cent as compared with other methods. A. S. Markley (C. & E. I.) called attention to the demands of the labor organizations that train crews be employed whenever the cranes are used on the main track, stating that the Indiana law now requires this. Even with this added expense he has found locomotive cranes economical. G. W. Rear (S. P.) stated that rubbish can be handled more satisfactorily if the cars are dumped first and the material then picked up. A bucket which will pick this up readily will dig into the floor. He stated that the California law requires an engineer, conductor and one brakeman to accompany a locomotive crane when working over one-half mile from a sidetrack on any line with more than four trains daily. He defined a locomotive crane as a hoisting apparatus which can be taken anywhere and is ready to work at any time.

PILE AND TIMBER TRESTLE BRIDGES

The sizes of standard parts and the amount of timber used for carrying the same loads under apparently the same conditions appear to be different and a large part of the difference is apparently due to personal equation, and also to a certain extent to the financial conditions of the various roads. For example, standard pile bents vary from 4 to 6 piles under approximately the same conditions. Standard stringers vary from 3-ply 8 in. by 16 in. to 4-ply 10 in. by 18 in. for carrying approximately the same loads on spans of nearly the same length. While, of course, it will never be possible to eliminate entirely the effect of personal equation, a more uniform standard of practice would appear possible.

OPEN DECK TRESTLES

A width of 8 in. appears to be almost universal for bridge ties, the spaces between them varying from 4 to 6 in., placing the ties from 12 to 14 in. center to center. The depth varies from 6 in. to 11 in., the great majority of roads reporting the use of a tie 8 in. deep, which the committee feels is the proper depth to use. A great deal of labor expended in the past by all roads and at the present time by some roads for dapping ties to fit down over the stringers can be avoided entirely, either by purchasing the ties surfaced to the exact height (7¾ in. in the case of 8-in. ties), or by gaining them in the field to exact depth. The first method is recommended.

Lengths of 9 ft. and 10 ft. have been reported for bridge ties, but the committee feels that a length of 9 ft. is sufficient except in those cases where a very heavy chord is used for long panels or for unusually heavy loads.

The lateral stability formerly provided by the shoulders of dapped ties fitting down over the stringers is now secured in some cases by the use of lag screws or drift bolts fastening every fourth tie to the stringers; and in some cases by driving

dowel pins into bored holes in the under surfaces of each end of every fourth tie, the ends of the dowels projecting downward into the packing space between the bridge stringers. The latter method is of advantage in eliminating the damage to the stringers caused by the insertion of lag screws, which frequently start decay on the tops of the stringers.

The committee feels that the track rails should be held securely in place on bridges by the use of tie plates having a length equal to the full width of the face of the tie, that is—8 in. wide, but it does not recommend the use of tie plates with claws piercing into the fiber of the tie as such plates are found to reduce more rapid decay of the tie. This does not necessarily require the use of flat bottom plates, as slight corrugations on the bottoms of tie plates will provide sufficient lateral holding power without breaking the fiber of the wood.

Regardless of all that has been said and written with reference to the dapped guard timber, no more effective means of holding the ties in place has yet been perfected. The committee feels that the practice that now prevails to some extent, i. e., the laying of a flat timber on top of the ties near their ends and fastening that timber to each end of each tie by a lag screw will not prevent the ties from bunching in case of derailment as effectively as the old dapped guard timber. The committee feels that the only effective method of preventing the ties from bunching is to provide between them struts having shoulders at the ends, bearing against the sides of the ties. Such struts made of malleable iron castings have been devised and are being used to a slight extent experimentally. Their advantage rests in the elimination of the labor of framing guard timbers, a very expensive procedure. If their experimental use proves successful, they should be used in preference to a flat timber lag-screwed to the ties.

The committee feels that inside guard rails weighing about 60 lb. per yard spiked to every tie and fully and carefully bolted to eliminate any offsets at the joints, should be laid entirely across every trestle ultimately, and that, as a move in that direction, roads not using such guard rails, commence their installations on high bridges, long bridges and all bridges on curves, the exact length and height to depend upon local conditions and the length of time over which the road desires to extend the expense of this improvement. Such guard rails should extend approximately 30 ft. beyond each end of each bridge and there come to a point either by the use of a casting inclosing the ends of the rails or by the use of an old frog point.

Bridge stringers in use on various roads vary from 6 in. to 12 in. in width and from 15 in. to 20 in. in depth. The most universal sizes appears to be 8 in. by 16 in., of which 3-ply stringers are used most universally although 4-ply stringers are extensively used on the longer panels and under the heavier engines. The panel lengths run from 12 ft. to 16 ft., the heavier stringers being used on the longer panels. All roads report the use of stringers twice as long as the panel length, alternate stringers breaking joints at the alternate bents. Stringers are usually framed to exact depth at the bearings. In the past and to some extent at the present time, stringers have been framed at the packing points to exact dimensions, but the best practice indicates the desirability of using stringers just as they come from the mills as far as width is concerned, thereby eliminating the extra labor and weakening of the stringer caused by cutting into the side to preserve exact dimensions. While the practice of framing the sides of stringers so the chord would pack to exact dimensions was excusable in the past when dapped ties were used, thereby making possible a fit of the dapped tie over the chord, the use of the undapped tie renders the exact width of the chord immaterial and the side framing of stringers should be dispensed with.

The various stringers composing a chord should be packed with spaces not less than ¾ in. clear between them, two chord bolts being put through each end of each stringer, making four chord bolts over each bent.

Although in the past when narrow chords were used, it was quite customary to place the chords outside the rails to give greater stability by the greater width of bearing on the caps, the increase in the width of the chords caused by more and heavier stringers has rendered this generally unnecessary, and, on account of the necessity of distributing the load on the rail equally among the various stringers in each chord with as little danger of over-straining or breaking the tie as possible, it seems desirable to place the center of the chord directly under the center of the rail.

To keep the caps and stringers from changing their relative locations at the bearings, many types of anchors are used, consisting of dapped corbels, packing blocks or boxes, drift bolts, through bolts, straps, etc. The tendency of the best practice today is toward the elmination of corbels, packing blocks or boxes and drift bolts, although drift bolts are still extensively used. Their use results in serious damage to stringers, as it frequently happens that, after they have been drifted down, they must be withdrawn in connection with relining or other work on the bridge and the pulling of such drift bolts is frequently a difficult operation, sometimes necessitating chopping into the stringers to get hold of them. The same result can be secured and the bolts made more accessible by boring entirely through the stringer and cap and placing at least one through bolt, not less than ⅞ in., entirely through the stringer and cap at each bearing. Although it is desirable for stiffness to have nuts and washers on the lower ends of these bolts, this is not absolutely necessary, as the lower ends extending under the caps provide means of starting them out in case of work on the bridge.

The caps in use vary from 12 in. by 12 in. to 14 in. by 14 in., a few instances being reported of the use of caps composed of several timbers framed over the tops of the piles. The framing of the tops of piles to fit into two or more timbers forming a cap appears unnecessary and has almost disappeared. For ordinary conditions a 12 in. by 14 in. cap 14 ft. long should be sufficient, the 12 in. dimension being vertical and giving a 14 in. width of bearing. There should be one or more drift bolts through the cap into each pile.

Replies indicate the use of four to six piles per bent, some roads using six piles on very low bridges, while other roads use four piles on very high bridges. Most roads report the use of a 5-pile bent. The designs of 5-pile bents submitted almost invariably show the middle pile entirely relieved from load, and the four outer piles of such bents would usually carry the same load per pile if the middle pile were omitted.

A great advantage in the use of a 4-pile bent occurs especially in redriving old trestles when the use of a 5-pile bent would require shifting the chord out of place during the driving of two of the piles under the stringers, while the 4-pile bent can be so arranged that for ordinary conditions the four piles can be driven without interfering with the old chord. This advantage, of course, will not obtain where the largest 4-ply chords are in use on bridges to be redriven.

The same conditions as to the number of posts apply to frame bents as to pile bents, the added requirement being the necessity for a firm, unyielding foundation under the frame bent. This foundation is sometimes provided, especially in new construction, by concrete pedestals, where rock is close to the surface. For high bents footing piles in sufficient number are frequently driven.

Some roads make a practice of cutting off old pile bents and placing frame bents on top of the old pile stubs. While at first glance such construction gives a very rigid support there are many undesirable features. When frame bents are placed on top of the old piles cut off at low-water line and having a considerable unsupported length in the water there is danger of their buckling out of line. Also the sills and lower ends of the legs of such bents and also of frame bents having the sills at or just below the ground line decay very rapidly and introduce an element of weakness into the bridge. Reports have been received indicating that all the pile bents of long, low bridges are frequently cut off when ready for renewal and replaced by frame bents. In such cases adequate longitudinal bracing should be placed at proper intervals to prevent the bridge from

collapsing longitudinally. If floods or other conditions prevent the placing of such longtitudinal bracing, a considerable percentage of all the bents should be renewed as pile bents.

The general practice seems to favor the use of 3 in. by 10 in. braces. On some roads the braces are bolted to the posts or piles, while other roads continue to use boat spikes. The committee recommends that the use of boat spikes for such purposes be discontinued, and that not less than 3 in. by 10 in. bracing be through bolted by ¾ in. or ⅞ in. bolts to the caps and piles or posts, double-sash bracing and two sets of "X" bracing being used in bents over 24 ft. high.

All roads reporting use of two or more lines of longitudinal struts or ties, varying in sizes, on all frame or pile bents over 24 ft. in height; these being placed above and resting on the sash bracing, and being bolted or spiked to the posts or piles. The best practice would seem to be that of cutting longitudinals to fit between the posts or piles, obtaining continually by the use of blocks or splices at the post or piles, securely bolted to them.

BALLAST DECK TRESTLES

The committee feels that the use of ballast deck trestles of treated timber should be given further consideration, as it is believed that very considerable economies can be shown by the use of such structures. The best information indicates that the cost of construction of a ballast deck trestle of creosoted material will be approximately 50 per cent greater than the cost of a similar open deck, untreated trestle of standard construction. For ballast deck trestles standard track ties may be used. There should be at least 6 in. of ballast, preferably sandy gravel, between the bottom of the tie and the floor of the trestle. The floor of the trestle should be composed of 4 in. plank 13 or 14 ft. long. To prevent water from getting into the floor and timbers below, the floor should be covered with a built-up roofing of about 4-ply felt and pitch. The sandy gravel ballast will make a sufficient bond with this roofing so that other covering over the pith will be unnecessary. Drainage should be provided by leaving open spaces between the floor of the trestle and the guard timbers at the edges of the ballast by raising the guard timbers 2 in. off the floor and providing a washer at each point, approximately 4 ft. apart, where the guard timbers are bolted through the floor.

The committee recommend that the stringers on ballast deck trestles be not sawed off at the ends, but that they be lapped, the length of stringer to be one foot longer than twice the panel length to provide practically a full bearing at each end of each stringer. It is thought that the equivalent of 4-ply 8 in. by 16 in. stringers under each rail for 14 ft. panels and 5-ply 8 in. by 16 in. stringers for 16 ft. panels will give sufficient carrying strength for any loads now operating. There appears to be no reason for the use of outer guard timbers on ballast deck trestles as the ballast will prevent the ties from bunching on the trestles as well as that service is performed on solid ground. Inner guard rails should be furnished, however, as on open trestle bridges.

A. B. McVAY (chairman), L. & N.; C. E. SMITH; F. G. JONAH, St. L. & S. F.; S. T. COREY, C. R. I. & P.; J. J. TAYLOR, K. C. S.; E. J. AUGE, C. M. & St. P.; A. J. JAMES, A. T. & S. F.; S. C. TANNER, B. & O., committee.

Discussion.—R. H. Reid (New York Central) favored framing the ties over stringers and bolting the guard rails to every fourth tie. He has found the bolting of ties to stringers unsatisfactory, in that it prevents the bunching of ties under derailments and also when renewing ties. J. P. Wood (Pere Marquette) opposed framing the ties at the mill, as it is then impossible to place the best face of the tie up. He had had no bridges go out of line. R. C. Sattley (C. R. I. & P.) favored bolting the ties to the stringers, because the track can be lined up readily by partially pulling the bolts. G. W. Rear (Southern Pacific) has used ties, which were sized up in the mill, for a period of 10 years, in which time he has had experience with 480,000 lineal feet of trestles up to two miles long. Ten bolts are used per panel for holding the ties to the stringers and two bolts for holding the stringers to the caps. No trouble has been experienced with these bridges going out of line. It is necessary to build bridges properly if they are to stay well built. F. J. Conn (Queen & Crescent) has used treated and dressed bridge ties with tie plates 31 in. long extending under the rail and inside the buard rail. The rails are held by screw spikes and the outside wooden guard rail is bolted through every tie.

The paragraphs regarding guard rails caused considerable discussion. G. W. Rear (Southern Pacific) advocated the use of rerailing castings at the ends of high bridges and the spacing of inside guard rails with a 3-in. clearance from the main rails. Most derailments are caused by broken flanges and wheels with broken flanges cannot derail with this construction. I. O. Walker (Western & Atlantic) has eliminated the dapping of guard rails since using creosoted timber. The guard rails are bolted to the ties and the ties are held in place by two castings per tie on the tops of the girders or I-beams. In discussing stringers Mr. Rear thought that all bolts holding the stringers to the caps should have the bolts placed on top. A. S. Markley (C. & E. I.) thought that no span should be of a length to require the use of more than three stringers because of the increased difficulty in driving other piles. R. H. Reid (N. Y. C.) also opposed using more than three stringers, stating that the New York Central Lines are now considering the shortening of the panel length rather than adding more stringers to accommodate heavier locomotives. L. Jutton (C. & N. W.) opposed running the bolt through the stringer and cap and advocated the use of a drift bolt with a square head enabling it to be pulled readily. The remainder of the report was accepted without discussion because of lack of time.

WATER WASTE

BY C. R. KNOWLES

General Foreman of Water Works, Illinois Central Railroad

As an example of what may be accomplished by a campaign against water waste, the Illinois Central has reduced the expense for city water alone from $225,112.94, during the fiscal year 1913-14, to 190,438,50 during the fiscal year 1914-15, a reduction in the cost of city water of $34,673.79. This is a net saving accomplished by the elimination of water waste. The expense for city water represents only about 40 per cent of the total cost for water, 60 per cent being for water pumped by company forces and not included in the savings which are given above.

Water is generally considered as free as the air we breathe, and much of the waste is due to carelessness on the part of employees who fail to realize its cost. It follows that careful instruction followed by disciplinary measures, where necessary, is the remedy in a campaign to reduce waste. This lack of co-operation, due to ignorance of the value of water, sometimes aided and abetted by departmental lines and jealousies, causes thousands of dollars' needless expense to the railroads of the country. American railroads consume daily approximately 1,950,000,000 gallons of water, at a daily expense of over $100,000. These figures should be enough to convince almost anyone that water is not free, and that a saving in water is quite as important as a saving in coal, oil or other supplies. It is safe to say that 15 per cent of the water used by railroads is waste. By waste is meant that quantity of water drawn in excess of the amount actually required. An employee who has the interests of the company at heart will not deliberately destroy property or waste supplies, yet that same employee will often leave a valve or faucet open, allowing water to waste and causing a needless expense that could be easily avoided. The opportunities for water waste on railroads are many and it is within the power of every railway employee to effect a saving in this respect.

A few illustrations of the most common forms of waste will be given with the cost of such waste and suggested remedies.

Large quantities of water may be wasted in taking water at tanks and penstocks, unless care is exercised to properly spot the engine and avoid overflowing the tender. Not only does this cause a waste of water, but it causes an additional expense for removing ice from the track in winter months and repairs to soft track during the summer. A conservative estimate of the total cost of this waste per annum is $60 per tank. With 30 tanks, the annual expense will be $1,800, a sum equal to 5 per cent on $36,000. This will pay the interest and depreciation on the cost of a new 100,000-gal. tank at each station in five years, or will build and maintain a locomotive each year. The remedy is to keep the tank spouts and the penstocks in proper repair and to compel due care in taking water on locomotives.

One of the most expensive sources of water waste is at engine houses, in connection with the use of boiler washout hose and valves. The water used for washing locomotives invariably has to be handled twice to secure the high pressure necessary to properly wash locomotive boilers. The average cost of such water is in excess of ten cents per 1,000 gal. A boiler washout hose with a 1-in. nozzle, at 100-lb. pressure, will easily

Wasting Water When Filling a Locomotive Tender

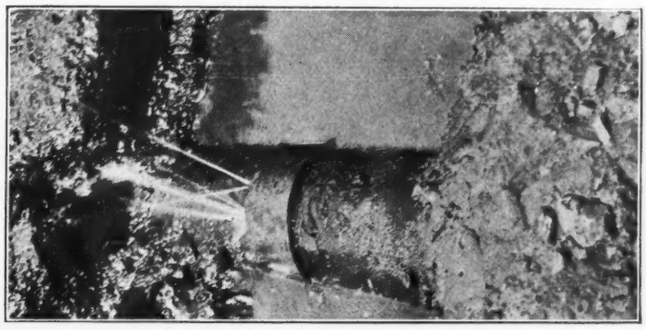
waste 12,000 gal. of water per hour at a cost of $1.20 to $1.50. This does not take into consideration the cost of heating water where hot water is used for washing. This is a very hard matter to control and results cannot be obtained except through the co-operation of the roundhouse force.

Laws prohibiting the use of public drinking cups have made the bubbling drinking fountains a necessity, but the makeshift affairs commonly constructed of ½-in. to 1½-in. pipe, and flowing constantly, are an abuse to this system of providing drinking water, and will waste from $150 to $350 per year for each fountain. The actual amount of drinking water required by a man is about ½ gal. per day. A single bubbling fountain with a ¼-in. opening will deliver 425 gal. per hour, at 25-lb. pressure, ample for 10,000 men, with 50 per cent waste. The only satisfactory way to control this waste is to restrict the size of opening and equip all fixtures of this kind with self-closing valves.

Yard hydrants for sprinkling, filling water jugs, and coach yard service also cause a heavy waste of water. A 1-in. hydrant of this type will waste from 20 to 30 cents' worth of water per hour, or $5 to $7 per day. Forty or 50 of these hydrants are often installed in a single coach yard and, as a number of them are nearly always open and running, the loss is enormous. The improper use of hose for sprinkling, washing coaches, etc., causes a great waste of water that may easily be avoided.

Leaking or improperly adjusted valves in toilet flush tanks will waste from $3 to $50 per month for each battery, depending on the number of fixtures and the cost of water. A case was found recently where toilet facilities at a large terminal were causing a loss of over $400 per month. In another instance the loss was over $150 per month. The trouble was corrected by cutting down the waste of water and the saving at these two points alone amounts to $10,000 per year.

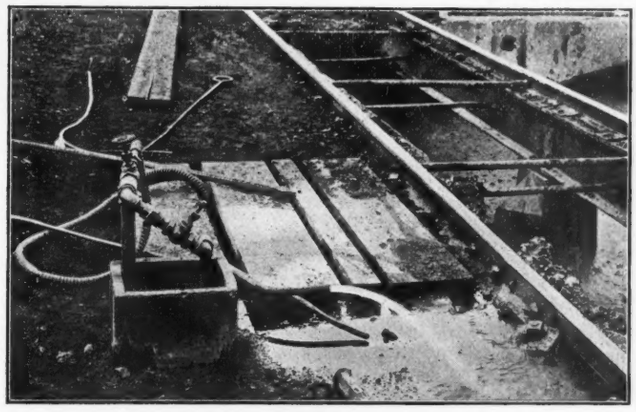
Wash basins, slop sinks and other fixtures connected direct to



Leakage from a Buried Water Main

sewers and drains offer opportunity for heavy water losses and a saving can be made in almost every instance by giving attention to valves and faucets, keeping them in proper repair and making it a point to see that they are closed when not in use.

Another source of waste is through leaks in underground mains. These underground leaks are not always easy to detect, for there is nothing in the old saying that "leaks will always show at the surface," for if the pipe is laid in a porous formation or near sewers, the water finds a ready outlet without reaching the surface. The presence of leaks of this kind may sometimes be determined by use of the aquaphone or sonoscope, or by carefully comparing the consumption with the pumpage or meter readings. But locating and repairing the leak is often



Wasting Water at a Submerged Cinder Pit

such a difficult matter that one sometimes wonders whether it is cheaper to permit the pipe to leak or make repairs. However, this question is easily answered. It always pays to stop leaks.

The saving effected in handling cinders with modern cinder-pit facilities is often destroyed by the waste of water through hose connections. The photograph shows an actual condition where the waste is 10 gal. per minute, 600 gal. per hour, 14,400 gal. per day. The cost is $1.44 per day, $10.08 per week, or $524.16 per year.

Fire hydrants are often used for drinking and other purposes with a resultant waste of water. One hunderd gallons of water are being wasted to secure a pint of water. A man will require water from 4 to 8 times per day of 10 hours, or an average of

6 times per day, and 20 men will drink 120 times a day. By using this method of securing their drinking water, they waste 12,000 gal. while drinking 5 gal.

Discussion—J. S. Robinson (C. & N. W.), a member of the committee, stated that his road was studying water waste in the Chicago terminals. It has recommended close supervision and minor improvements in equipment, which it is estimated will result in an annual saving of $24,000. I. O. Walker (W. & A.) told of an instance in which water used to cool an air compressor was recovered with a resulting saving of $80 a month.

MANILA ROPE

By F. E. Weise

Chief Clerk, Engineering Department, Chicago, Milwaukee & St. Paul

Possibly there is no article in the outfit of a railroad construction organization or of a contractor that suffers more neglect and abuse than manila rope. In nine cases out of ten, this condition is due more to a lack of knowledge than to wilful neglect. It is the general impression that the use of Manila rope is decreasing and that it is being replaced by wire rope, but this is true only along certain lines and, on the contrary, the field for its use is increasing.

Fibers from which ropes are made are termed by manufacturers as hard and soft. The hard fibers are of Manila, sisal and New Zealand hemp, and the soft fibers are of jute, American hemp and flax. Of the hard fibers, very little New Zealand hemp is used. The best rope for all purposes is made from Manila hemp, and very little rope over one inch in diameter is made from anything else. Sisal hemp is shorter and coarser than Manila, is not as strong and will not withstand water or the weather as well. Considerable rope less than one inch in diameter is made of sisal hemp. The soft fibers are used mainly for the manufacture of small rope and cord. This paper is to be limited to the best and larger ropes, and, therefore, deals entirely with Manila rope.

Until rather recently all rope was made by hand, but its manufacture has been revolutionized by the introduction of modern machinery. In a modern plant the bales of fiber are opened and graded as to quality by expert workmen, and are then passed to machines where the fibers are reduced to suitable size for rope making. After this operation the fiber is spun into yarn by twisting it in a right-hand direction. From 30 to 75 yarns, according to the size of the rope, are put together and twisted in the opposite, or left-hand direction, into a strand. Three or four of these strands are then twisted together in a right-hand direction into a rope. In the manufacture of a very large rope or cable, three hawers or three strand ropes are twisted together in a left-hand direction. It will be noted that each operation is in an opposite direction, and because of this, the rope keeps its form. The rope maker has learned by long experience how to make these twists so that the tendency of one part to untwist will cause another part to twist until an equilibrium is attained. If the twist is great, the rope will be hard and stiff, and will keep its form well, but will not be as strong as a rope with less twist. This is explained by the fact that in the latter case the fibers lie more nearly in the line of tension.

A good hemp rope is hard, but pliant, yellowish or greenish gray in color, with a certain silvery or pearly lustre. A dark or blackish color indicates that hemp suffered from fermentation in the process of curing, and brown spots show that the rope was spun while the fibers were damp, and is consequently weak and soft in those places. Sometimes a rope is made of inferior hemp on the inside, covered with yarn of good material. This may be detected by dissecting a portion of the rope. Other inferior ropes are made from short fibers, or with strands of unequal lengths or unevenly spun, the rope in the first place appearing woolly, on account of the ends of the fibers projecting; in the latter case the irregularity of manufacture is evident on inspection.

A test for ascertaining the purity of Manila hemp rope consists in forming balls of loose fiber for the ropes to be tested and burning them completely to ashes; pure Manila burns to a dull grayish-black ash; sisal leaves a whitish-gray ash; a combination of Manila and sisal yields a mixed ash resembling the beard of a man turning from black to gray. Manila hemp is frequently adulterated with phormium (New Zealand flax) and Russian hemp, both of which are much inferior in strength.

It is not always true that the highest priced material is the best, and there are no doubt many cases where from lack of knowledge or time for investigation, a better grade of material is purchased and used than is necessary. The price of this material is governed largely by its quality, but the selection of the quality should be governed by its suitability to the work in hand.

Rope in service deteriorates in two ways: The wear on the outer surface that can readily be seen, and the stretching, bending, crushing and breaking of the inner fibers that cannot be discovered without a careful examination.

Should these conditions develop more rapidly than the service in which the rope is used seems to warrant, they may be due to the following causes: The first might be caused by chafing, resulting from ropes rubbing against each other or dragging across hard materials, or by running over sheaves having too small grooves. The latter may be due to overload or to running over sheaves or pulleys of too small diameter.

Ropes do not give out all at once, and therefore need much care and attention. The factors that determine the usefulness of a rope and its length of service or life are: the material of which it is made; the care and skill with which it is manufactured; the manner in which it is used or its application, and the care taken of it while in service and while being stored.

Manila hemp is a vegetable fiber and is susceptible to the action of water and air the same as an unprotected piece of wood. In fact, the hardest wear on a rope is exposure to all kinds of weather. This cannot be avoided in construction work; therefore, when a rope has become wet and muddy, it should be cleaned, dried and stored in a well ventilated place. Wet rope placed in a box or unventilated storeroom is likely to rot or ferment and will become worthless in a very short time. Ropes that must necessarily be constantly exposed to the weather are tarred frequently, but as the tar affects the tensile strength, it cannot be used on ropes that are subject to hard use on derricks and cranes. Tarred ropes may be used for guy lines, the rigging of ships or similar work.

It is generally conceded that moisture will not injure a rope in storage, provided the storeroom is well ventilated, and in fact some dealers advocate a damp storeroom. On the other hand, a rope may be seriously injured by becoming too dry, because the fibers become brittle. A rope should not be allowed to freeze after becoming very wet, or if frozen, should not be used, because the frozen fibers will break and thus make it useless. Neither should rope be piled against radiators or steampipes for obvious reasons.

The failure of ropes is more likely to be due to overloading than to any other cause. Should a rope be submitted to an overload, it may be shown by the twist coming out of it, or by one of the strands slipping out of its proper place. In the handling of heavy loads with a derrick or crane, the load should never be applied suddenly or with a jerk, not only because the stress will be many times that of the weight to be lifted, but it will cause deformations in the rope that start deterioration. Should there be a kink in the rope, the damage may be serious enough to cause failure, and in any event the rope will have lost a good deal of its strength and value. Ropes used on derricks, cranes and pile drivers wear out very rapidly. It is said that a rope 1½ in. in diameter will wear out in handling from 7,000 to 10,000 tons of coal, while a transmission rope of the same size, running 5,000 ft. per min. and carrying 1,000 h.p. over sheaves 5 ft. and 17 ft. in diameter, will last for years.

The rapid wear of ropes used on derricks and pile drivers is

due to their passing over comparatively small sheaves under load. When passing over a sheave, the rope is subject to bending, which causes the fibers to slide slightly on each other, and, as they are somewhat rough, the friction ultimately causes the fibers to break. Frequently upon opening up ropes of this kind, it is found that some of the inner fibers have been ground to a fine powder. Manufacturers aim to overcome this difficulty by treating the fibers with tallow or graphite, or both, but there seems to be considerable difference of opinion as to the value of such treatment. Tallow-laid rope is not affected as much by weather conditions as rope not so treated. Should it be necessary for a rope to run over two sheaves, bending first in one direction and then in another, the difficulty last described is much exaggerated, and is much like bending a pliable wire first one way and then the other. It will soon break.

It is frequently necessary to splice the ends of two ropes together in order to make one long rope. Either a short splice or a long splice may be used. If properly made, the short splice will develop the full strength of the rope, but it cannot be used over a sheave because it is considerably thicker than the original rope. The long splice can be used over a sheave, but it cannot be expected to give as good service as an unspliced rope. The short splice is more quickly made.

Manila rope is usually supplied to the storekeeper in coils of 1,200 ft., and shipped out by him in lengths suitable for the work. The shorter pieces left over are used for making slings. After it is worn out, rope is returned to the storekeeper as scrap. The accumulation is disposed of from time to time by selling to scrap dealers at a price approximating $50 per ton.

Slings made from Manila rope for handling and hoisting heavy materials do not always receive the care and attention that they should, largely because of a lack of knowledge of what a sling will stand. Many advocate the use of new rope, and this is without doubt the safe plan. A new rope, however, is too stiff and it is better, where possible, to use parts of a rope that have been limbered up by a day's service. There are others that advocate the use of old rope for this purpose. If this is done, care should be taken to select pieces that have not been overstressed or that have not been working over sheaves. An examination can easily be made by opening up the strands, and if the inner fibers show deterioration, the rope should not be used for slings. Slings are made by splicing the two ends of a rope together, using usually what is known as the short splice.

On construction work and during wet weather, slings are subject to severe usage. When muddy, they should be thoroughly cleaned, preferably with a hose, before the mud has been allowed to dry. They should then be allowed to dry under shelter, but never in the hot sun.

When slings are sent to the tool car or toolroom for storage, they should be inspected carefully and such as are not fit for continued use should be discarded. Those in good condition should be hung on suitable pegs. Slings are frequently called for in a hurry and under such conditions there is not always time to make an examination, or it may be overlooked. It is well to be on the safe side, because the failure of a sling may result in serious injury to the workmen and a fall of only a few feet may damage or utterly ruin a piece of machinery.

The method of attaching a sling to a load should always be delegated to a reliable and experienced man. Whether one or more slings are to be used will depend not only on the weight of the load to be lifted, but also on its shape. In placing a sling on a load, care should be used to see that the load is evenly distributed on the two sides of the hoisting hook and also that the turns of the sling do not overlap, thereby throwing an excessive stress upon one part of it.

The stresses that are thrown upon slings and ropes vary a great deal with conditions, and they are often influenced to a marked degree by circumstances, which the casual observer might consider trivial and unimportant. In particular, the inclination or obliquity of the sling, in those parts which lie between the supporting hook and the points at which the sling first touches the load, must be carefuly considered, as it is a highly important feature in connection with safety.

COALING STATIONS FOR THE ECONOMICAL HANDLING OF 25 TO 50 TONS PER DAY

There are four types of coaling stations of this class, a platform where the material is unloaded and delivered to the engines by hand shoveling; a stiff leg derrick with the necessary coal storage and operating platforms; a station where cars are pushed up an inclined trestle and the coal unloaded into small pockets and delivered to the engines by gravity; and mechanical coaling stations where the coal is dropped by gravity into hoppers and elevated into large pockets by means of buckets or conveyers operated by mechanical power.

The coal platform can hardly be called a coaling station, as it is only a makeshift.

The stiff leg derrick is probably the one most used at stations where a small amount of coal is handled. The construction of the derrick at this plant is much the same as for any stiff leg derrick. The boom, however, is generally rigid, being placed at a fixed angle and far enough out to properly reach the center of the track. It is, therefore, necessary to operate only the main hoist and the swing of the derrick. Adjoining such a derrick is a storage platform of proper size and length to store as much coal as is considered necessary at the plant. At one of these stations where the average amount of coal handled per day was 12 tons, the cost of handling per ton was 17.9 cents. This station was operated by one man, assisted by the train brakemen in coaling engines. At another such coaling station, where the average amount handled per day was 31.2 tons, the cost of handling per ton was 12.6 cents. Comparatively speaking, the first cost and maintenance of a derrick station is low; the third mentioned type of station is cheaper to operate than the derrick type, although for small amounts the derrick will compare favorably with it. It costs more than the derrick, and the maintenance is much more. For small amounts the derrick is better than the trestle type of chute, and for large amounts the mechanical type is the better.

The mechanical type of station is coming into use more and more and has many things to commend it for economy of operation. It is not the intent here to discuss the merits of the different types of mechanical coal chutes, but rather whether the mechanical chute is adaptable to small stations. At a certain coaling station where an average of 44.5 tons of coal is used the cost of handling is 8.2 cents per ton. One man is employed days and one man nights. If it were necessary this amount of coal could be increased 50 per cent without increasing the number of men employed. The mechanical plant is high in first cost, and the maintenance may be considerable after the plant gets old. Nevertheless, a good mechanical plant is cheap to operate and has many points in its favor even where a small amount of coal is used.

In general the cost of handling coal at small coaling stations is large, as a certain amount of labor is necessary, no matter how small the amount of coal handled. It seems advisable where small coaling stations are necessary that some other occupation should be found for the men employed in the coaling plant. Where conditions are right a water station can be operated advantageously in connection with the coaling station. If the two facilities are properly located with respect to each other and the most improved machinery is installed at both plants, one man working days and one man nights can operate the combined plant where the coal consumption amounts to about one car load per day and the water consumption amounts to about 40,000 gal. per day.

The report is signed by L. Jutton (chairman), C. & N. W.; W. T. Krausch, C. B. & Q.; B. F. Pickering, B. & M.; J. L. Talbott, A. T. & S. F.; A. W. Pauba, C. & S.; G. A. Manthey, M., St. P. & S. S. M.; Wm. Mahan, W. & L. E.

COST OF STRUCTURES

DETAILS TO BE KEPT IN TIME BOOK

The usual practice seems to be for the gang foreman to enter in a time book for each day the time and overtime allowed for each man and sufficient information for making up a distribution and the prescribed reports. Very few roads require any more detail than the title of the job and possibly a few subdivisions. The majority use a monthly or semi-monthly time book, except in a few states where weekly payments are required by law. These time books vary from the small stock book, which can be bought in stationery stores, to a monthly diary giving a complete record of labor and material, an outline of work done, a tool report and other general information required from the foreman.

It would seem desirable that a time book should be adopted of a size to be carried readily in the pocket and to be ruled properly to show one month's or one week's time as conditions require. On a large road it would not seem desirable, however, to combine all of the foreman's monthly reports in one book, as such a book would be cumbersome for the foreman and for the clerks who handle the accounts. The committee recommends a time book using one double page for the time and distribution for each man. The last page of this book should give a recapitulation, distributing the total time of the gang between the different Interstate Commerce Commission accounts, as these greatly facilitate the work of the time clerks in consolidating the distribution. A system of sub-accounts for similar work should be made up to suit local conditions and the structures on which the work is performed, such as excavation, foundation, concrete and masonry above the foundation, concrete forms, steel work, framing, painting, plumbing, lighting, etc.

REPORTS OF MATERIAL USED

The usual practice is for the foreman in charge of a gang to make some form of monthly material report, either in a monthly diary or on loose sheets. The committee considers that the material report should be sent in by itself, either in a special book or on loose sheets, the reports from the different foremen being consolidated in the division supervisor's office, and made up into one material report. If a printed book is furnished to the foreman it should have pages for the material received, used and shipped away, and a record of the cars received.

Material should be distributed to various subdivisions for each job the same as labor, and on the completion of each job a completion report should be made. In addition to the title of the job and the date of completion, this should show the number of units and the cost of each class of work, such as the number of yards of excavation, the cubic yards of concrete, the weight of steel erected, etc. It will, of course, be necessary to have several different forms of completion reports to cover the costs of different classes of work.

RECORDS TO BE KEPT IN DIVISION OFFICES

On most of the larger roads it is the custom to keep all detailed records in the division offices, collecting the information from the various gangs and making a complete cost record to the general offices. The systems in use are varied, some using blank forms or stock ruled books, and in a few cases a special loose leaf or card file. In many cases, so far as the keeping of unit costs or the cost of jobs is concerned, the system is left to be worked out by the individual supervisor so that there is very little uniformity even on different divisions of the same road.

In most cases, the cost records which are being kept at the present time simply cover the accounts required by the Interstate Commerce Commission and the total costs of structures or pieces of work. It would seem desirable that more extensive records be compiled not only to show the costs of all structures, but the costs of the various items going to make up the total, such as the number of cubic yards and the cost per yard for excavation, masonry and concrete work of various classes; also the cost per 1,000 feet for framing and erecting all of the usual classes of timber work, etc. For keeping such records, a loose leaf ledger or card system would seem to give the best results, as it gives greater flexibility and opportunity for growth and also an opportunity for classifying similar kinds of work.

The complete cost of a piece of work should in all cases include not only the labor and material used, but the system should be such that all other items of expense, such as work train, teaming, board of men and other necessary expenses, should be included. The cost statement should also show any second-hand material used as well as an explanation of any unusual charge due to bad weather, accidents, time lost in traveling or other items which would affect the cost.

A completion report blank to cover all of this information would be so large and complicated as to be out of the question. It would therefore be necessary to make up a number of printed forms for the various classes of work.

With all of the detail records kept in the division offices, the only cost records to be sent forward to the general offices should be cost cards or sheets showing completed structures, cards showing unit costs and graphic tabulations or comparative statements. These records should be submitted in a form so that the cost of similar work on various divisions can be compared and filed with as little labor as possible. By using cards or blanks of a uniform size these can be filed very readily in card index system and comparison readily made. The costs of similar work on the various divisions should be tabulated; this showing which divisions are doing the work most efficiently. Various reports showing the distribution of labor and material to maintenance of way accounts must also be made to the auditing department to comply with the Interstate Commerce Commission regulations.

ANALYSIS OF COST

On many roads complete records are kept for large construction jobs, particularly on concrete construction, the costs being analyzed and unit cost data worked out. This scheme, however, does not seem to be followed very extensively on maintenance work. Cost records on all jobs should be so kept that statements can be made up showing the distribution to the different subdivisions and also worked out for unit costs as outlined under the previous subject.

It is very desirable that graphic tabulations and curves be made up to show both labor and material and the total charges to all of the maintenance accounts to compare with former years. Similar graphic tabulations and curves can be made up where a number of similar structures are built on different divisions or under somewhat similar conditions.

A system of cost records analyzed for unit costs is of immense value to any road, not only for future estimates, but especially in connection with the United States valuation of railroads. The committee recommends that costs of this kind be kept by each railroad, feeling that the expense involved will be more than offset by the benefits to be derived from their use after a few years.

G. A. Rodman (chairman), N. Y., N. H. & H.; F. E. Weise, C., M. & St. P.; J. H. Nuelle, N. Y., O. & W.; J. S. Robinson, C. & N. W.; R. S. Sattley, C., R. I. & P.; C. W. Wright, L. I.; W. A. Pettis, N. Y. C., committee.

WARNINGS FOR OVERHEAD AND SIDE OBSTRUCTIONS

The necessity and the value of giving proper warning to men on top or on the side of cars before passing overhead or side obstructions on railroads is evident. When a train passes some overhead or side structure, tunnel, etc., with less than the requisite overhead clearance to allow a man to stand erect on top of the highest box car, or the necessary side clearance to permit him to hang on the side of a car, his limb or life is jeopardized.

Only four states have enacted legislation regulating the requirements for side clearances and ten states regarding overhead clearances. The following is a tabulated summary of the

statutory requirements of the several states which enacted legislation as to railroad clearances:—

State	Overhead clearances above top of rail	Side clearances from center of nearest track
Connecticut	18 ft. 0 in.	
Ohio	21 ft. 0 in.	18 in. from locomotive cab
Indiana	21 ft. 0 in.	7 ft. 0 in.
North Dakota		8 ft. 0 in.
Kentucky	22 ft. 0 in.	
Minnesota	21 ft. 0 in.	8 ft. 0 in.
Mississippi	23 ft. 0 in.	
New Hampshire	21 ft. 0 in.	8 ft. 0 in.
Rhode Island	18 ft. 0 in.	
Michigan	7 ft. above roof of freight cars passing over line.	

	Width of bridges
Vermont	Single track, 15 ft. 0 in.; double track, 27 ft. 0 in.

There has been a tendency in the past few years to enlarge the side clearance diagrams for bridges, but, until the maximum size of motive power and equipment is established by legislation or other method, there seems little relief in sight by reason of the enlargement of the clearances. It is an acknowledged fact that, up to this time, the size of motive power and equipment has closely followed the available clearances, and this will, no doubt, continue until some restraint is placed on the enlargement of the motive power and equipment.

E. G. STORCK (chairman), P. & R.; F. E. SCHALL, L. V.; T. E. THOMAS, B. & O.; M. M. BARTON, P. R. R., committee.

REINFORCED CONCRETE BRIDGES

Three methods of procedure in placing slabs are common: (a) constructing slabs at a central point, hauling them to the bridge site on flat cars, and setting them in place with a derrick or wrecker; (b) Building slabs at the bridge site at the side of their permanent location, and skidding them into place; (c) Where there is sufficient head room, the slabs built at the bridge site are, of course, constructed in place. There is a decided preference for casting slabs at a central point and lifting them into place. Fourteen roads with a mileage of 64,700 follow this method, while 11 roads, with a mileage of 31,000, report building slab at the bridge site.

The conditions governing the use of the first method are (a) the renewal of a bridge on the same alinement, while maintaining traffic on all tracks. Where the span is not too long, a temporary trestle to carry traffic is built to clear the finished structure. The slab is then built under traffic. Where long spans of a new structure prohibit the construction of a trestle, the tracks are shifted temporarily beyond the limits of the structure. (b) The renewal of a bridge on the same alinement with traffic closed on one track: The slab is built on sections 13 ft. wide, under the closed track. This method obtains only on large construction, where the forces can be moved to some other part of the work during the time allowed for the concrete to set. When the concrete under the closed track has set, a different track is closed and its traffic diverted to the track on the finished slab. (c) The renewal of a bridge or new construction on a change of alinement: Such work is generally constructed by contract. Company forces are usually employed where the construction interferes with traffic. The conditions governing the use of the second method are where unit construction is used where traffic must be maintained on all tracks without interruption for any length of time without change of alinement. The methods of handling work trains depend largely on whether the work is being done by company forces or by contract. A large system that does the work by company forces necessarily has its work train service well systematized. When called out, the train is kept busy during the full day. In this class of work the train has little to do beside moving the materials. Wherever possible, material is allowed to accumulate at the nearest station until enough is on hand to make a full day's work for a train. Where this is not practicable, it is handled by the local freight. The material is handled by the men on the job, whether on company work or contract. Where the work train service is for contract work, it is quite a general practice to make a fixed charge for this service. Under this arrangement the contractor can have all the train service he requests, but it will be to his interest to use it only when he actually needs it.

The differences in the work train service on the various roads appear to be due more to the difference in the amount of the service, and to the local conditions, than to any established practice in the handling of such trains.

The question of methods for concreting in cold weather and protection against frost is one on which the southern roads have little to say, but with the roads of the northern states and Canada the question is a live one. Wherever practicable, all concrete work is done during the warm months, but where the winter season is long, it becomes necessary to do considerable concreting in freezing weather. The necessity for heating the ingredients in freezing weather and keeping the concrete warm after it is placed, is generally acknowledged. The methods for accomplishing this vary considerably. The different methods of heating the sand and stone are steam pipes, steam jets and fires in pipes or under grillages laid under piles of material. The protection of the concrete in place is secured either by housing it in and warming with stoves, steam coils, etc., or by covering it with double forms with air spaces, sacks, tarpaulins, hay or anything that will prevent the circulation of air in contact with the forms. Salt is used under certain restrictions, in mass concrete, but, obviously, it cannot be permitted in reinforced concrete on account of the action of salt on the reinforcing steel. The preparation of test pieces during the progress of the work has been recommended frequently. In order to show the condition of the concrete the test pieces must be exposed to the same conditions as the concrete from which they are taken. This test is not recommended as a means for determining the quality of the cement, or other ingredients in the concrete; this must be determined before they are mixed. It has been suggested as a means for determining whether the concrete has hardened sufficiently for the removal of the forms and has been done more frequently perhaps, in connection with building work, than on bridges.

It is evident from the reports of the roads that the making of test pieces is not by any means general. The replies of 21 roads, with a total mileage of 53,500, is "no." Eight roads, with a mileage of 46,500, advise that they make test pieces on certain work, or under special conditions of construction.

The question of the spouting of concrete called for a great variety of answers. Three roads reported that spouting is not permitted on their work under any conditions. Ten roads permit spouting without any specific restrictions as to slope or distance, but subject to the general requirement that the concrete shall be delivered in good condition at the forms. Sixteen roads permit spouting under specific restrictions as to slope, distance, amount of water, etc.

Evidently there is a great deal of dissatisfaction with, or distrust of, this practice. The rules and restrictions under which spouting is permitted on most of the roads reporting indicate that the method will give satisfactory results, provided the work is properly conducted and carefully supervised. On those roads where it is prohibited, the belief evidently prevails that concrete can not be delivered in good condition by this method, or that the abuse of the method can not be wholly prevented by their inspection service.

The facility with which concrete can be delivered over a considerable range by spouting makes it desirable to permit the method, provided the work can be supervised so effectively that there will be no abuse of the method. That this is the most general view is shown by the number of roads, and the mileage represented by the roads permitting spouting under specific restrictions.

As to precautions to insure thorough mixing the belief is apparently quite general that if the mixture is left in the mixer long enough, no other precaution is necessary to secure good mixing. The inspector or supervising foreman is left largely to his own devices on hand mixing. If he is an experienced and

competent man he will get the desired results, but there will undoubtedly be many variations in the methods adopted by different men to obtain the same results.

Machine mixing is generally required on all work of sufficient magnitude to justify a mixer, and batch mixers are quite generally specified. Continuous mixers are apparently not in good standing among the engineers who write the specifications and prescribe the methods. When hand mixing is done, the manner of mixing is sometimes specified in detail, requiring the sand and cement to be mixed dry, then the stone added with some water and the mass shoveled until all of it has been turned a specified number of times, water being added during the mixing until the required consistency is obtained.

The cement gun (using compressed air) and the atomizer (using steam) have been developed within the last few years. They are not intended for use in placing concrete where the ordinary equipment will serve, and where concrete of the usual quality is wanted. The duty required of them is to place the material where it is not practicable to deposit it in forms, and to give a dense and impervious product. The deposited mixture is mortar. The cement gun uses no stone. The atomizer uses stone up to ¾ in. in the mixture, but the stone rebounds from the surface to which it is applied. Its only function is, apparently, to pack and tamp the mortar against the surface to which it is applied.

These machines can be used to good advantage when applied to the kinds of work to which they are adapted. It appears from the reports received, however, that these appliances are in use on only a very few roads, and the engineers in charge of concrete construction can not speak from personal experience. Twenty-six roads report not having used either kind, but the roads which have used them nearly all report satisfactory results. One road reports that in one instance, at least, the results were unsatisfactory. The kind of work or the nature of the defect was not stated.

It appears to be the common practice to leave it to the engineer in charge to determine the time when forms can be removed safely, without handicapping him with detailed instructions. The weather conditions and the kind of structure enter largely into the considerations. A few roads report tests, such as breaking off exposed portions of the work, or using test pieces that are made at the same time and exposed to the same conditions as the work.

There is a wide range in the time allowed for setting, even under the same weather conditions. This may be accounted for by assuming that structures of entirely different character were in mind when the different replies were written.

A general review leads to the conclusion that in summer weather, mass concrete, such as retaining walls, abutments and piers, should have two to three days, and a little more if the structure is high or massive. When weather is cold, but not freezing, the time should be from one to two weeks. Forms for slabs, arches and culverts should remain in place in warm weather, from one to two weeks, and the structure should not be loaded for 30 days. In cold weather, the time should be correspondingly longer.

O. F. Dalstrom (chairman), C. & N. W.; A. Montzheimer, E. J. & E.; I. L. Simmons, C. R. I. & P.; J. A. Bohland, G. N.; C. J. Scribner, C. B. & Q.; D. C. Zook, P. L. W.; T. J. Stuart, W. P., committee.

CONCRETE CULVERT PIPE AND CONCRETE PILES

Concrete piles are used by the railroads for a variety of purposes and particularly for reinforced concrete slab trestle bridges. This use is of particular interest in that the reinforced concrete pile slab trestle type of construction presents a seemingly perfectly satisfactory and economical solution of the pile and timber bridge replacement question in many instances, for those openings which are too large for small culverts of a permanent character. The Chicago, Burlington and Quincy, which was the pioneer road with this type of construction, has constructed about 20 miles of concrete pile trestles, some of which have been in service eight years. The Chicago, Milwaukee & St. Paul started manufacturing and using concrete piles for concrete trestles in 1912 and since that time upwards of 30,000 lin. ft. have been made and driven. On account of the delay to trains that might be occasioned by driving on main lines of heavy traffic, this company has constructed most of its concrete pile trestles on a second track or on lines where the traffic is not very dense.

The Great Northern, the Illinois Central, the Minneapolis, St. Paul & Sault Ste. Marie, the Northern Pacific and the Wheeling & Lake Erie are among the roads that make considerable use of concrete piles for trestles. The Great Northern now prefers, however, in place of concrete pile bents, slim reinforced concrete piers extending one to two feet below the surface of the ground, and supported on piles, with longitudinal struts for heights about 20 ft.

Most of the railroads agree that the premoulded reinforced concrete pile is suitable for use in trestle bents, that they allow loads of from 20 to 35 tons per pile and that the penetration required under ordinary conditions varies from about 2/5 to 2/3 the length of the pile, while the maximum projection above the ground recommended varies from 10 ft. to 30 ft. Several roads agree on about 20 ft. for the maximum projection above ground unsupported, while some limit this height to about 14 or 16 ft. and build slim concrete piers for greater heights.

The premoulded type of pile seems to be preferred by the greater number of roads, which is due partly to the necessity of using this type for trestle work. The octagonal, straight-sided pile about 16 in. in diameter appears to be the most used shape. The steel reinforcement of concrete piles should be designed not only to take a portion of the load that may be placed upon the pile after it is driven, but also to take care of the bending stresses that occur when the pile is lifted either by the middle or by one end and to withstand the shocks caused in dragging it over rough ground to the loads and the jars occasioned in driving.

While a great many different makes and types of piles have been used, it is comforting to observe that there have been no failures reported and that very few piles have been broken in handling or in driving and none under load. On the strength of this record it would seem that there should be no need of hesitation on the part of railroad engineers and builders to use concrete piles where the conditions make this type of construction the most economical.

CONCRETE CULVERT PIPE

The use of concrete culvert pipe is much more general among the railroads than that of concrete piles. While some of the roads have used this pipe in special instances, or for experimental purposes only, quite a number use the pipe generally for sizes ranging from 24 in. to 48 in. internal diameter inclusive. A few make common use of sizes varying from 12 in. to 72 in. inclusive, while at least one uses as large as 84 in. x 89 in. oval pipe.

It is not the general practice to restrict the heights of embankments under which concrete pipe is used, other than to specify a certain minimum depth of cover over the pipe, which minimum varies from 8 in. between the bottom of tie and the top of the pipe to about 3 ft. from the base of rail to the top of the pipe. The road reporting the 8 in. minimum stated that its only reason for not placing pipe closer than 8 in. to the tie is that a less distance than this does not afford sufficient protection to the pipe from injury from tamping tools. There is involved in this discussion of the restriction of the heights of embankments, of course, the general question of the appropriateness of placing a rather small pipe under a very high fill, even though the drainage requirements are satisfied. Some roads do not place pipe culverts of small diameter under extremely high fills irrespective of the fact that their carrying capacity is ample to take care of the unexpected quantity of water.

It is not the usual practice to have two or more designs of concrete pipe of the same diameter with different amounts of reinforcement and thickness of the walls for use under different

heights of embankments. The Chicago, Rock Island and Pacific, however, does make such a distinction, having a design known as Class "B" for embankments up to 20 ft. in height and another known as Class "C" for embankments from 20 to 40 ft. high The amount of reinforcement and the thickness of the walls are both increased in the class "C" design.

In 1906 Prof. Arthur N. Talbot of the University of Illinois tested to destruction several sections of 48 in. and 36 in. reinforced concrete culvert pipe. The results of these tests, which were made under laboratory conditions of bedding and loading, are recorded in bulletin No. 22 of the University of Illinois. This bulletin recommends certain formulae for the design of reinforced concrete pipe which are pretty generally accepted.

More roads use head walls on one or both ends of the concrete pipe culverts than do not use them. The bell and spigot continues to be the more popular type of joint, while the roads are pretty evenly divided on the question of cementing the joints. All of the joints, no matter of what type or whether cemented or not, seem to be pretty uniformly satisfactory.

The length of time the pipe should cure before shipping shows a very considerable variation ranging in air from 10 days to 60 days, while some roads do not install pipe that is less than 90 days old, although they ship after pipe has cured 60 days. While there have been a few failures of pipe in place and a considerable number have been broken in handling, many of these are due either to poor concrete or to the pipe being used too green. If a rich, dense concrete, which is allowed to cure a reasonable length of time, is provided in reinforced concrete pipe which are intelligently designed and installed, we believe that the railroads should feel perfectly safe in adopting this construction wherever it seems desirable to do so. H. Rettinghouse (chairman), C. S. & P., M. & O.; S. T. Corey, O. R. T. & P.; G. H. Stewart, B. R. & P; C. F. Urbutt, C. M. & St. P., committee.

PROTECTION OF GRADE CROSSINGS

All public crossings should be marked by crossing signs placed as conspicuously as possible to indicate the proximity of tracks. This is essential even though flagmen may be on duty, a bell ringing, or other warning given to drivers of approaching vehicles. A whistling post should be placed on the engineer's side of the track a quarter of a mile from the crossing so that trains may give warning of their approach. To further indicate to drivers of vehicles and trainmen the locations of crossings, the cross fences should be painted white or whitewashed.

It is important that the roadway at railroad crossings be kept in good condition. Even in cases where it is only incumbent on the railroad to maintain the roadway between its rails and for two feet outside, the necessary steps should be taken to see that the approaches are maintained on easy and uniform grades, and free of ruts or rough spots which might possibly stall an automobile or otherwise contribute to hazard at the crossing. The area between the rails should be kept well filled, and if a smooth crossing can not be obtained otherwise, guard rails should be used.

Objects which obstruct the view of crossings either from approaching trains or vehicles should be removed as far as possible. Whatever protection may be provided at a crossing will be inefficient if the view from all directions is obscured by trees or other obstructions. Proper care in this respect may greatly reduce the hazard of accident.

The choice between the forms of protection in common use lies between gates, wigwag signals, or so-called automatic flagmen, and flagmen. There is no rule for determining the choice of protection, but the best device may be indicated by local conditions of topography, the widths and layouts of roads or streets, the angle of crossing, etc., or it may be chosen after experience and observation of a particular case.

Crossing gates are suitable for roadways crossing one or two tracks where the traffic is not greatly congested. Where the teams are very numerous, the time required to operate gates tends to block the traffic and create congestion. There is the further possibility of vehicles being caught between the gates or of the gates being lowered on them. Where the roadway crosses a large number of tracks, gates are least satisfactory. There are cases of well improved highways in suburban or country districts where automobiles are run at high speed where gates are sometimes run through. In an article in the *Railway Age Gazette* of July 16, 1915, a crossing is described and illustrated where the ordinary light gate has been replaced by a spruce pole about 10 in. in diameter as an effective barrier against automobilists who approach the crossing at reckless speed. This gate is painted with spiral bands of black and white to attract attention at a considerable distance. The Southern Pacific has tried red paint and stripes on its crossing gates, but a subsequent canvass of automobile drivers indicates a preference for plain white gates as being easier to distinguish, especially at dusk or dawn. In the opinion of the committee white is the best color for gates.

There are various types of gates, wire-pull, electric and pneumatic, all having the same idea of placing a barrier across the roadway. Some have ticklers and others fence attachments, but these are but variations of the barrier idea. There is also in use an automatic gate which is operated in a manner similar to automatic signals. This has not been found satisfactory as yet. It is apt to lower on a vehicle, or if constructed too high to strike a wagon is too tempting for malicious persons to tamper with it.

A very good additional protection in connection with crossing gates is a red light hung on the gate at night, with blinders on the sides so that it will not be visible to the engineers of approaching trains. This light is replaced during the daytime by a red disk.

The Southern Pacific is conducting experiments with a form of warning signal consisting of a red disk 16 in. in diameter located 200 ft. from the crossing. As automobile associations are providing signs which serve the same purpose it is perhaps better for railroad men to look out for the immediate crossing only.

Where traffic conditions do not require gates or flagmen the best form of signal is the automatic flagman or wigwag, which consists of a red disk displaying a red light at the center, which is suspended from a bracket away from the line of poles. The disk and light swing through an arc in the lower quadrant and attract attention readily from the roadway for a considerable distance. In some respects this device is superior to a flagman. There is no variation in the signaling. The movement is always the same. When in motion it can indicate but one thing—that a train is approaching. A bell may be rung in connection with the visible signal, and this is advisable in certain districts; but in residential sections, where trains are numerous or where the signal may be operated for long periods on account of switching movements, the bell may be removed and the device used as a visible signal only. The cost of installation of the wigwag varies with the number of switches within the limits of the electric circuits, the presence of automatic signal circuits, etc. The minimum cost is approximately $60 for labor and $260 for material, or a total of $320. On account of other circuits and switches within the operating limits of the signal the cost may reach as high as $500.

No matter what the railroads may do in the way of eliminating danger at grade crossings their efforts are of little avail unless the public co-operates to the extent of observing warning signals set up for its protection. Pomona, Cal., causes the arrest of persons who disregard the city ordinances which require the drivers of vehicles to stop before crossing a railroad track. A personal way of checking up careless drivers is for gatemen or flagmen to note the vehicle numbers and write to owners and employers. It is our experience that employers are glad to be advised of instances where their employees show carelessness in crossing tracks.

CONCLUSIONS

1. Where feasible, grade crossings should be eliminated.
2. Obscure crossings should be opened up to the view as much as possible by the removal of trees, buildings, brush or other obstructions.

3. Roadways at track crossings should be maintained in the best possible condition.

4. An automatic flagman, gates or flagmen should be provided as local conditions may require.

5. All means possible should be used to induce the public to use caution at grade crossings.

E. C. Morrison (chairman), S. P.; A. T. Mercier, S. P.; F. M. Nelson, S. P.; A. Ridgway, D. & R. G.; J. B. Gaut, G. T.; J. H. Johnston, G. T.; C. E. Johnston, K. C. S.; J. B. Sheldon, N. Y., N. H. & H.; G. H. Jennings, E. J. & E.; F. O. Draper, I. C., committee.

OTHER REPORTS

An extended report on Railway Water Tanks was presented by C. R. Knowles, chairman. Because of lack of space it is necessary to hold it out of this issue, but it will appear in the November Maintenance of Way Section.

A report was presented on Efficient Methods of Handling Work and Men by G. W. Rear (S. P.). An abstract of this will also appear in the November Maintenance of Way Section.

OTHER BUSINESS

The following subjects were selected for consideration at next year's meeting:

Brick, Cement, Asphalt and Wood Block Floors for Shops, Roundhouses, Freight Houses, Highway Bridges, etc.

Paint and Its Application to Railway Structures.

Fireproofing Roofs of Wooden Buildings.

Water Supply Intakes and Intake Lines for Internal Combustion Engines.

Caring for and Handling Creosoted Material.

Blank Forms for Bridge and Building Department.

Modern Methods of Driving Piles.

Efficient Methods of Handling Work and Men.

Economical handling of Concrete on the Smaller Jobs.

Station Buildings for Passenger Service Only.

Small Coaling Stations.

On Tuesday evening about 315 members and supply men were guests of the Bridge and Building Supply Men's Association at a dinner and vaudeville entertainment given in the Hotel Statler.

Wednesday afternoon was spent in an inspection trip by special train through the Michigan Central tunnel and over the Windsor terminal. A trip was also made through the plant of the Ford Automobile Company.

On Wednesday evening about 200 members and guests attended a banquet at the Hotel Statler. Special emphasis was placed on the early history of the association. The speakers included Past President W. A. McGonagle, Secretary C. A. Lichty, Vice-President G. W. Rear, J. B. Sheldon, E. T. Howson and C. R. Knowles.

On Thursday afternoon the members and guests enjoyed a boat excursion on the Detroit river.

ELECTION OF OFFICERS

The election of officers on Thursday morning resulted as follows: President, G. W. Rear, general bridge inspector, Southern Pacific, San Francisco; first vice-president, C. E. Smith, consulting engineer, St. Louis, Mo.; second vice-president, E. B. Ashby, chief engineer, Lehigh Valley, New York; third vice-president, S. C. Tanner, master carpenter, Baltimore & Ohio, Baltimore, Md.; fourth vice-president, Lee Jutton, division engineer, Chicago & North Western, Madison, Wis.; secretary-treasurer. C. A. Lichty, general inspector, Chicago & North Western, Chicago. Members of the executive committee were chosen as follows: F. E. Weise, chief clerk, engineering department, Chicago, Milwaukee & St. Paul, Chicago; J. S. Robinson, division engineer, Chicago & North Western, Chicago, and J. P. Wood, supervisor bridges and building, Pere Marquette, Saginaw, Mich.

SUPPLY ASSOCIATION

The Bridge and Building Supply Men's Association held an exhibit in a room adjoining the one in which the meeting was held, with about 25 firms represented. The exhibits consisted largely of models, samples, photographs and literature. The officers of this association for the past year were: President, J. A. Meaden, Paul Dickinson Company; vice-president, D. A. Bonitz, National Roofing Company; secretary, L. D. Mitchell, Detroit Graphite Company; treasurer, H. A. Neally, Joseph Dixon Crucible Company.

At the annual meeting held on Thursday morning the following officers were elected: President, D. A. Bonitz, National Roofing Company, Tonawanda, N. Y.; vice-president, H. A. Neally, Joseph Dixon Crucible Company, Jersey City, N. J.; treasurer, L. D. Mitchell, Detroit Graphite Company, Detroit, Mich.; secretary, P. O. Jacobs, H. W. Johns-Manville Company, Chicago. Members executive committee: H. H. Huested, Asphalt Ready Roofing Company, New York; M. J. Trees, Chicago Bridge & Iron Works, Chicago; and W. H. Pratt, Heath & Milligan Company, Chicago.

The following firms had exhibits:

American Hoist & Derrick Company, St. Paul, Minn. Represented by F. J. Johnson and W. O. Washburn.

Asphalt Ready Roofing Company, New York City. Represented by C. A. Sparrowhawk and H. H. Huested.

American Valve & Meter Company, Cincinnati, Ohio. Represented by J. T. McGarry.

Barrett Manufacturing Company, New York City. Represented by J. I. Holder, E. J. Caldwell, K. C. Barth and A. C. Wiles.

Philip Carey Company, Cincinnati, Ohio Represented by C. L. Cockrell.

Chicago Bridge & Iron Works, Chicago. Represented by M. J. Trees and C. S. Pillsbury.

Chicago Pneumatic Tool Company, Chicago. Represented by T. D. Slingman, C. E. Walker and F. McComber.

Joseph Dixon Crucible Company, Jersey City, N. J. Represented by H. A. Neally.

Detroit Graphite Company, Detroit, Mich. Represented by T. R. Wyles, J. J. Hogan, L. D. Mitchell, F. G. Hogan and E. Booth.

Paul Dickinson, Inc., Chicago. Represented by J. A. Meaden and A. J. Filkins.

Fairbanks, Morse & Co., Chicago. Represented by G. J. Akers, A. A. Taylor, F. M. Condit and K. P. Brown.

Heath & Milligan Company, Chicago. Represented by W. H. Pratt.

H. W. Johns-Manville Company, Chicago. Represented by P. C. Jacobs, W. H. Lawrence, C. E. Murphy, H. A. Waldron and J. C. Younglove.

The Lehon Company, Chicago. Represented by Thomas Lehon and D. B. Wright.

C. F. Massey Co., Chicago. Represented by C. F. Massey and Charles Gilman.

National Roofing Company, Tonawanda, N. Y. Represented by D. A. Bonitz.

George P. Nichols & Brother, Chicago. Represented by George P. Nichols.

The Patterson-Sargeant Company, Cleveland, Ohio. Represented by M. R. Stowell.

Pyrene Manufacturing Company, New York. Represented by W. H. Sherman and R. H. Neal.

Railway Age Gazette, Chicago. Represented by L. B. Sherman and E. T. Howson.

T. W. Snow Construction Company, Chicago. Represented by T. W. Snow.

Standard Asphalt & Rubber Company, Chicago. Represented by C. V. Eades and R. E. Kartack.

Toch Brothers, New York. Represented by A. H. Rhett.

United States Graphite Company, Saginaw, Mich. Represented by H. F. Gump, A. W. Walker and J. F. Lee.

U. S. Wind Engine & Pump Company, Batavia, Ill. Represented by C. E. Ward.

PENNSYLVANIA ANNUAL TRACK INSPECTION

The annual track inspection of the Pennsylvania Railroad east of Pittsburgh and Erie was made on October 5 and 6 by S. C. Long, general manager, and a party of about 350 operating officers. This inspection covered the main lines between New York and Pittsburgh and between Philadelphia and Washington. The first, or "Klondyke" prize of $1,200, divided on the basis of $800 for the supervisor and $400 for the assistant, and awarded for the best maintained subdivision throughout the year, went to C. Z. Moore, supervisor, and L. R. R. Fleming, assistant supervisor, in charge of track between Dillerville, Pa., and Harrisburg. Premiums of $800, $600 for the supervisor and $200 for the assistant supervisor, were awarded for the subdivision having the best line and surface on each of the four main line divisions. These prizes went to C. M. Wisman, supervisor, and H. M. Grimm, assistant supervisor, in charge of track between Tullytown, Pa., and Dean, N. J.; W. T. Hanly, supervisor, and J. B. Baker, assistant supervisor, in charge of track between Marysville, Pa., and Thompsontown; R. H. Pinkham, supervisor, and F. X. Bradley, assistant supervisor, in charge of track between New Florence and Donohoe, Pa., and to G. H. B. English, supervisor, and C. M. Hursh, assistant supervisor, in charge of

track between Wilmington, Delaware, and Perryville, Maryland.

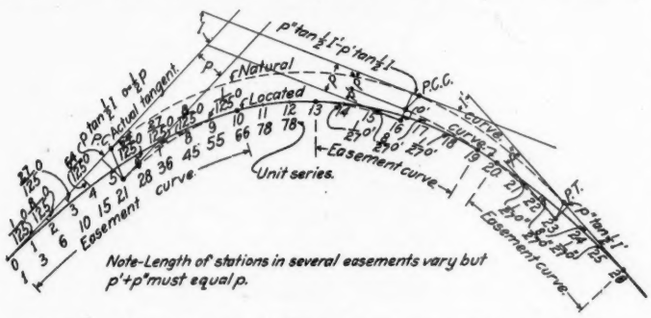
A special improvement prize of $1,000, divided $700 to the supervisor and $300 to the assistant supervisor, offered for the greatest improvement made in line and surface on a supervisor's subdivision, was awarded to W. G. Shaner, supervisor, and T. K. Minsker, assistant supervisor, in charge of track between Baltimore and Springfield, Md.

These awards were not based entirely upon the general manager's inspection, but frequent inspections were also made during the year by a special committee composed of W. G. Coughlin, engineer maintenance of way; A. B. Clark, assistant engineer maintenance of way; J. J. Rhoads, superintendent Media division, and E. J. Cleave, superintendent, Cresson division. The methods of conducting this inspection were described in detail in an article by Joseph T. Richards, consulting engineer maintenance of way, in the issue of January 22, 1915.

THE ADVANTAGE AND COST OF SPIRALING CURVES*

BY W. F. RENCH
Supervisor, Pennsylvania Railroad, Perryville, Md.

It was universally the practice in the early days of railroads, as it very generally is today, to locate a line as a succession of tangents and circular curves with no provision for present or future easements. Although operation is possible over such an alinement it must necessarily be at a very moderate speed and even then accidents are of not infrequent occurrence. When locomotives were small and the greatest speed attainable was comparatively slow, the lack of easements for the lighter curves was not felt, but their absence from the sharper curves was always a source of trouble. Indeed, it is difficult to conveive how operation was otherwise than precarious upon many such curves that were devoid of easements. The presence of superelevation presupposes curvature and the very fact of a tangent track being several inches out of level, whether at the approach to a curve or elsewhere,



A Study of a 10 and 6 Station Spiral with Offsets and Unit Series Ordinates

suggests the possibility of accident. The records of most branch roads contain the account of derailments occurring at the ends of curves, the causes of which were never satisfactorily ascertained. But the fact is pertinent that such accidents become noticeably fewer following the proper spiraling of the curves. With the increase of speed in both passenger and freight schedules the addition of easements has become not merely a refinement for comfort but a necessity for safety.

Various methods have been used in providing present easements on old lines. The first was usually to throw the ends of the curve outward, which served to remedy part of the defect. But the resulting protrusions beyond the tangents were both unsightly and to some extent uncomfortable. When adjoining curves turned in the same direction and the tangent between was short it readily appeared that a relining of the entire tangent would effect the necessary correction, although in most cases the protrusion was allowed to remain as the lesser of two evils. But as methods were evolved for the lining of curves the flat places developed by the outward throw of the ends were eliminated by lining the entire body of the surve inward, the throw being often as much as 6 in. Finally, when such methods, at first crude, were further improved, a complete adjustment was made on exact lines, the protrusions being removed, a more efficient easement provided and finer detail line of the curve attained. The last adjustment almost always consisted in making first an inward throw of the ends, both to remove the protrusions that makeshift correction or the natural movement with the traffic had produced and to flatten the curve for the easements, and then an outward throw through nearly the entire body of the curve, varying in amount from 2 in. to 6 in., to modify the sharp places which the previous throws had introduced at each extremity of the remaining arc. The net result of the several changes was a lengthening of the curve amounting to about 75 ft. on each end and a sharpening of the circular portion by about 3 per cent of the initial degree.

As affecting the question of introducing easements into the original location or at least of providing the means for such correction at a later time when the roadbed shall have settled, it will be instructive to study the cost of the relining necessary to attain this end when no such provisions has been made. It will no doubt be thought that the value of the labor thus spent is so indefinite as to be impossible of even approximate estimation. But the record of cost on a typical branch road of medium traffic and maintenance is offered as a suitable criterion. The road, which is cinder ballasted, is 44 miles long and the speed prescribed is 40 miles per hour. The alinement follows the shore of a river through all its points and bays and contains 185 curves, several as sharp as 8 deg., the average of all being 3 deg. 20 min. It is safe to say that each has had the three general lining adjustments referred to during the 20 years of the road's operation. The final correction of one-fourth of the curves was made quite recently and a measure of the expense is therefore readily obtainable.

For this last operation the average cost, including both the throwing and subsequent surfacing made necessary, was 3⅓ cents per foot of curve. The throws were no greater than 6 in. and the average throw was 2½ in. It is a conservative assumption that the total cost of the several adjustments was three times the cost of the one operation, or 10 cents per foot of curve. For the road in question on which the curves compose 57 per cent of the total length, the expense of adjustment was $300 per mile of single track line. The labor necessary for spiraling the curves thus amounted to no less than $13,000, a considerable sum, which would unquestionably have been largely saved if ultimate addition of easements had been provided for in the original alinement.

The type of easement that is most suitable for general use is the one that can be most readily designed for application with an instrument and that can be most easily maintained afterward by string lining. The cubic parabola, a curve whose deflection angles vary as the square of the distance and whose offsets vary as the cube of the distance, fulfills both requirements. The method of developing this curve in string lining was described in the *Railway Age Gazette* of May 15, 1914. The same relation between distance and deflection angles or offsets may be shown to apply to all spirals whose ordinates increase from a unit quantity by successive additions that are in an arithmetical progression with the difference equal to the unit quantity. Thus in the series of ordinates, 1 in., 3 in., 6 in., 10 in., 15 in., 21 in., in which the value of the unit is 1 in. and the maximum addition is 6 units, the curvature through each station would be represented by the mean of the adjacent ordinates or by the series ½ in., 2 in., 4½ in., 8 in., 12½ in., 18 in., in which it is seen that the ratios of the several members to the first are as the squares of successive numerals, 2 being 4 times ½, 4½ being 9 times ½, etc.

The use of such a series extended as far as necessary, with the unit having the value suited to the individual case, will reduce to a minimum the labor of designing an easement.

The value of the unit to be used with this series in any particular instance may be obtained by dividing the ordinate of the body of the curve by the highest number in the series that is required by the length of easement adopted and the ordinates of the easement by multiplying each number of the series by the value of the unit. For example, if it is desired to use an easment curve five stations long the sixth number in the series, 21, would represent the ordinate coinciding with the ordinate of the main curve. If this were 8 in., the value of the unit for that easement would be 8 in. divided by 21, or 3/8 in. The ordinates of the easement would then be 3/8 in., 1 1/8 in., 2 1/4 in., 3 3/4 in., and 5 5/8 in. The mean of the adjacent ordinates changed to degrees of arc would supply the mean curvature through each station and one-half of this would give the deflection angles needed for applying the curve in an original location. Such a curve has been found in many cases to approximate closely the spiral developed by the more expert track foreman in lining by eye, so that it has the sanction of practical experience.

The error of the system in which the ordinates are made proportional to the distance cannot be better shown than by an exhibit in parallel.

Middle ordinate by the cubic parabola	Degree	Super-elevation	Degree	Middle ordinate by regular proportion
1/8 in.	0 min.	0 in.	.....	.....
3/8 in.	11 min.	2/3 in.	23 min.	3/4 in.
3/4 in.	23 min.	1 1/3 in.	45 min.	1 1/2 in.
1 3/8 in.	41 min.	2 in.	1 deg. 07 min.	2 1/4 in.
2 in.	1 deg. 00 min.	2 2/3 in.	1 deg. 30 min.	3 in.
2 3/4 in.	1 deg. 22 min.	3 1/3 in.	1 deg. 53 min.	3 3/4 in.
3 3/8 in.	1 deg. 49 min.	4 in.	2 deg. 15 min.	4 1/2 in.
4 1/4 in.	2 deg. 23 min.	4 2/3 in.	2 deg. 38 min.	5 1/4 in.
6 in.	3 deg.	5 1/3 in.	3 deg.	6 in.
6 in.	3 deg.	6 in.	3 deg.	6 in.

It will be noted that by this scheme a superelevation of 2/3 in. obtains where the degree of curve is 23 min. and 1 1/3 in. where it is 45 min., but that by the cubic parabola the superelevations for similar degrees are respectively 1 1/3 in., and 2 1/4 in., which have been found by experience to be the correct selection for a speed of 70 miles per hour, and indeed, agree substantially with the theoretical value by the well-known formula of mechanics. No one can doubt that the superelevations by the former method are wholly insufficient and it is this condition mainly which causes the deflection noticed in going on and off such a curve, even when it is newly adjusted. Through the strain introduced by this deficiency there is a tendency toward quick distortion and the defect increases until a lurch is the inevitable result.

A brief resume of the effect of the final correction upon the alinement of the curves through a typical mile on the branch line mentioned above is given below in tabular form. The adjustment also involved some change in the direction of the tangent.

Name of curve	Original degree	Present degree	Original length	*Present length	Length of easement
State Line	7	7 1/4	468	681	155
Frazer	8	8 1/4	771	961	155
4th No. M. P. 14....	1 1/2	1 5/8	364	496	93
3rd No. M. P. 14....	3	3 1/8	302	434	124
2d No. M. P. 14....	3	3 1/8	413	589	124
1st No. M. P. 14...	4	4 1/4	707	868	124
M. P. 14.....	4	4 1/4	411	558	124

*Includes length of easements.

While the locating engineer may reasonably claim that in general it is an unnecessary refinement to stake out the detailed spiral curve preliminary to new construction, it cannot be denied that provision ought to be afforded for such adjustment and a statement of the practical working limits from the maintenance standpoint should be of service. It is believed that the situation will be met satisfactorily by the use of the following plan. Stake out the circular curve between imaginary tangents parallel to and a selected distance within the actual tangents. Shorten the circular curve on each end by half the length of the easement and locate points on the actual tangents at the same distance in the opposite direction. Re-locate the stakes marking the original ends of the circular curve a distance outward equal to one-half the selected offset distance. This location will enable the track-laying forces to adjust the curve by eye with sufficient precision for the purpose of the new construction and will allow the final detailed adjustment to be made later at nominal expense.

The amount of the offset will depend upon the length of easement desired and this in turn will be governed by feasibility and the service required. The least offset that is of practical utility is one whose length in tenths of a foot is equal to the figure representing the degree of curve. This will provide an easement curve with a half length of 60 ft. If a longer easement is desired and is not impracticable, the offset distance would be increased in proportion to the square of the half length For a very satisfactory adjustment upon a branch of medium traffic such as the case described above, the half length of easement might be made 75 ft. and the offset distance would then be equal in tenths of a foot to 1½ times the figure for the degree of curve.

If a run-off at no greater rate than ½ in. to 30 ft. were desired for a 4 deg. curve to be operated at 40 miles per hour with the superelevation of 3 in. attained 60 ft. upon the circular curve the half length of 60 ft. would be proper and the offset distance would be 0.4 ft., but if the same curve were part of an important main line route to be operated at 55 miles per hour and the rate of the run-off for the 6 in. of superelevation necessary were desired to be as low as 1 in. to 100 ft., a half length of 250 ft. would be required and the offset distance would be 7 ft. In the latter case it would be necessary to stake out the entire easement curve, preferably by 50 ft. stations, and the above described methods would apply or, if preferred, the location might be made by offsets, for one-half the easement curve from the actual tangent and for the other half by similar offsets in inverse order from the located circular curve. With this method, equal stations could be used when the several offsets would be the proportion of that at the middle of the easement determined by the cube of their relative distance from the ends of the easement. Thus, in the case cited the first offset would be 1/125th of 3.5 ft. or 0.028 ft. and the several other offsets, respectively, 8, 27 and 64 times this, or 0.22 ft., 0.76 ft., and 1.79 ft.

The same methods would of course apply to the easement between two curves of considerably different curvature. The offset distance between the imaginary tangents at the P. C. C. would then be computed from the difference in the numbers representing the degree of the two curves and the several offsets would be measured from the two circular arcs. The unit middle ordinate would be obtained by dividing the difference between the ordinates of the two curves by the highest number of the series applicable and the spiral ordinates then obtained would each be increased by the amount of the ordinate of the lighter curve.

In fitting the spiral curve as determined by its middle ordinates to the same curve as determined by its offsets it must be noted that there necessarily is an ordinate at the beginning of the spiral and while by the geometric requirements of the curve this ordinate will be of the unit value, which should always be used in the design, the actual value when measured with the chord extended half upon the curve and half upon the tangent will be one-half the unit value. It should also be understood that the circular arc commences one station back of the first point of full ordinate and ends one station in advance of the last point of full ordinate.

GERMAN-MADE RAILWAY THROUGH BELGIUM.—It is reported that the construction of the new railway line between Aix-la-Chapelle and Brussels, via Vise, is being vigorously pushed forward. German workmen are busy day and night. The building of a new bridge near Lische will begin shortly. The railway through Belgium will be an almost straight line, without regard to private property or natural obstacles. It appears that the German authorities consider the railway of the greatest importance, not only for the present, but also for the future.

General News Department

The twenty-ninth annual convention of the Canadian Ticket Agents' Association was held at Denver, Colo., on October 18.

A Union Pacific combination passenger and baggage motor car fell off a bridge weakened by high waters into a creek near Randolph, Kan., on October 16, causing the deaths of 16 passengers, it is reported, and injuring a large number of others. A trailer remained on the track.

On Wednesday afternoon Charles S. Mellen, president of the New York, New Haven & Hartford from 1903 to 1913, took the witness stand in the criminal suit against the New Haven directors under the anti-trust la wand described in detail the traffic situation in New England previous to July 2, 1890.

The Employees' Relief department of the Baltimore & Ohio is now 35 years old and the aggregate amount of its payments, to June 30, 1915, is $20,096,883. More than half this sum went to pay for sick benefits and death benefits having no connection with accidents. The relief department fund lends money to employees of the road, to assist them in buying homes, and in the last fiscal year the sum of $1,440,000 was lent for this purpose.

Five men held up a freight train on the Erie Railroad in Bergen cut, near Glen Rock, N. J., on the night of October 20, and attempted to steal part of the contents of a freight car supposed to contain silk. It is thought that the train was stopped by tampering with the air brake hose and when the trainmen got down to make an examination they were held up by five men. While one of the men kept the trainmen covered the others broke into the freight car, but before the contents of the car could be unloaded two railroad detectives, who were riding on the train, came up and began firing into the car. The robbers returned the fire, but managed to get away to an automobile waiting nearby.

The Erie's Eightieth Anniversary

On Saturday, November 6, the Business Men's Association of Deposit, N. Y., will celebrate, with a parade and speeches, the eightieth anniversary of the Erie. On November 7, 1835, the first ground was broken for the Erie Railroad at Deposit, N. Y. At the time that this construction work was begun the president of the company, James G. King, made the prediction that fully 200,000 tons of freight would be transported over the railroad a year. Last year the Erie handled 42,874,315 tons of freight.

The Value of Motor Cars

At the meeting of the New York Railroad Club on Friday, October 15, a paper on "The Value of Motor Cars on Railroad Systems" was read by W. R. McKeen, Jr., consulting engineer, motor cars, Union Pacific. Mr. McKeen laid stress on the value of motor car service in stimulating passenger travel and stated that by this means an increase ranging from 50 to 100 per cent may easily be obtained in from 6 to 12 months. Among those taking part in the discussion were A. W. Jones, General Electric Company; R. B. Williams, Jr., president, Central New York Southern, and D. F. Crawford, general superintendent motive power, Pennsylvania Lines West of Pittsburgh.

Lehigh Valley Buys New Equipment

The Lehigh Valley has announced that it has ordered 10 new Mikado type freight locomotives from the Baldwin Locomotive Works, that it will have 20 other engines rebuilt and equipped with superheaters, Walschaert valve gear, etc., and that it has contracted for a considerable addition to its floating equipment in New York harbor. This will include: a new steel tug, 109 ft. over all, with 28 ft. 1 in. beam and 14 ft. 6 in. depth, with a towing capacity of 10,000 tons; four 12-car capacity and three 8-car capacity steel car floats; two 120-ft. barges and six 90-ft. barges. The company has also bought a 500-ton capacity gasolene hoisting lighter.

Including the new freight locomotives, the 20 locomotives which are to be overhauled and improved, another 100 locomotives recently rebuilt and equipped with superheaters, and the 2,000 box cars rebuilt in outside shops, together with the harbor boats just ordered, the Lehigh Valley has spent over $2,500,000 for equipment in the last few months.

Head-On Collision on the Rock Island

In a head-on collision on the Chicago, Rock Island & Pacific between a southbound passenger train, No. 11, and a northbound freight, No. 98, on a curve at Agawam, south of Chickasha, Okla., early Tuesday morning, two firemen, one brakeman and four tramps were killed, and 45 passengers were more or less injured and the two enginemen were seriously injured. Both trains received a 31 order for train 11 to wait at Agawam until 1.15 and at Rush Springs until 1.25 for train 98. As the collision occurred half a mile west of Agawam at 1.08 or 1.09, the passenger engineer apparently must have failed to obey the order. On Wednesday he was still unconscious, so there has been no statement from him.

The freight engineer was late with a train of livestock and left Rush Springs at 12.55, with 20 minutes to go about seven miles and clear passenger train by 10 minutes. About one hundred head of cattle were killed and both engines and several cars were seriously damaged. The tramps were killed riding on the blind baggage car. There are no block signals in this territory.

I. C. C. Issues Circular on Car Shortage

The Interstate Commerce Commission has recently issued a circular giving warning of a possible car shortage and urging cooperation to obtain the greatest efficiency in the use of the car supply. The commission says:

"Informal complaints to the commission indicate that the annually recurring failure of transportation facilities known as 'car shortage' is again appearing. The commission urges on all shippers and all carriers that close attention to methods of loading, unloading, moving, and promptly returning to use the cars now available will go far toward making the present supply of cars sufficient for all purposes.

"In order that the business of the country may go forward without interruption, the commission urges shippers, both individually and through their associations, to co-operate to secure the prompt and full loading of cars and their prompt release. One of the chief causes of failure of car supply in past seasons has been the unnecessary detention of cars by careless shippers and by shippers using them for storage purposes. In the general public interest, shippers should endeavor to release cars at the earliest possible moment without regard to the free time given by the tariffs.

"All the efforts of the shippers will be unavailing, however, unless the carriers also use extraordinary measures to eliminate all delays chargeable to them. The failure of car supply is usually a failure of car movement. The congestion of terminals is the ever present feature at times of such failure. The commission therefore urges carriers to make every possible endeavor to improve their methods of operation of terminals in order that cars may move promptly. Also company material should be unloaded with the same despatch that is required of shippers.

"The commission is moved to make this appeal by its desire to save both shippers and carriers from the losses which are occasioned by failures of car supply, and by its knowledge that measures such as are here suggested to have operated in past seasons to save all concerned from heavy losses."

Howard Elliott, president of the New York, New Haven &

Hartford, has sent a copy of the circular to the newspaper editors, with the following letter asking the co-operation of its patrons:

"During the last few years, from various causes, the railroads of the country have been unable to make such additions to tracks, yards, equipment, and facilities as are now necessary to keep pace with the growth of business in the country. This is especially true in New England, and there is danger that there will not be transportation enough produced to meet the daily demands. The condition of the railroads in this respect is not different from many other large industrial plants that have more orders than they can fill.

"The danger of a shortage in transportation can be reduced if every user of it is very prompt and if he co-operates with the railroad in trying to make the best of a difficult situation. Shortage of trackage, oftentimes, causes us much, if not more, trouble than shortage of cars, and close co-operation between shippers and carriers will help prevent congestion, the result of which does harm not only at the particular point where it exists, but all along the line.

"The New Haven management is using every effort it can put forth to obtain the full use of all its facilities and to furnish all the transportation it can, and asks the help of its patrons at this time when facilities in many places are overtaxed."

Summary of Revenues and Expenses of Steam Roads

The Bureau of Railway Economics' summary of revenues and expenses of railways and comments thereon for July, 1915, are as follows:

Net operating income of the railways of the United States for July increased $39 per mile, or 13.3 per cent, as compared with July, 1914. This increase was due in the main to reductions in expenses, which have been effected in all parts of the country. In July, 1914, net operating income per mile was 3.1 per cent less than in July, 1913.

Total operating revenues amounted to $258,526,363, an increase from 1914 of $2,567,724. Operating expenses were $171,526,861, a decrease of $6,990,534. Net operating revenue amounted to $86,999,502, an increase of $9,558,258. Taxes amounted to $11,574,582, an increase of $217,588. This left $75,377,176 for net operating income, available for rentals, interest on bonds, appropriations for improvements and new construction and dividends. Operating revenues per mile of line averaged $1,130, an increase of 0.3 per cent; operating expenses averaged $750, a decrease of 4.6 per cent; net operating revenue per mile averaged $380, an increase of 11.5 per cent, while net operating income per mile was $330, an increase of 13.3 per cent. Taxes per mile increased 1.2 per cent. Railways operating 228,713 miles of line are covered by this summary, or about 90 per cent of the steam railway mileage in the United States.

Operating revenues of the eastern railways per mile show an increase of 3.8 per cent as compared with July, 1914, operating expenses decreased 3.9 per cent, net operating revenue increased 22.5 per cent, taxes decreased 0.3 per cent and operating income increase 26.2 per cent.

Operating revenues of the southern railways per mile decreased 4.5 per cent, operating expenses decreased 9.2 per cent, net operating revenue increased 9.7 per cent, taxes increased 1.9 per cent and operating income increased 11.2 per cent.

Operating revenues of the western railways per mile show a decrease of 1.4 per cent, operating expenses decreased 3.1 per cent, net operating revenue increased 2.1 per cent, taxes increased 2.6 per cent and operating income increased 1.9 per cent.

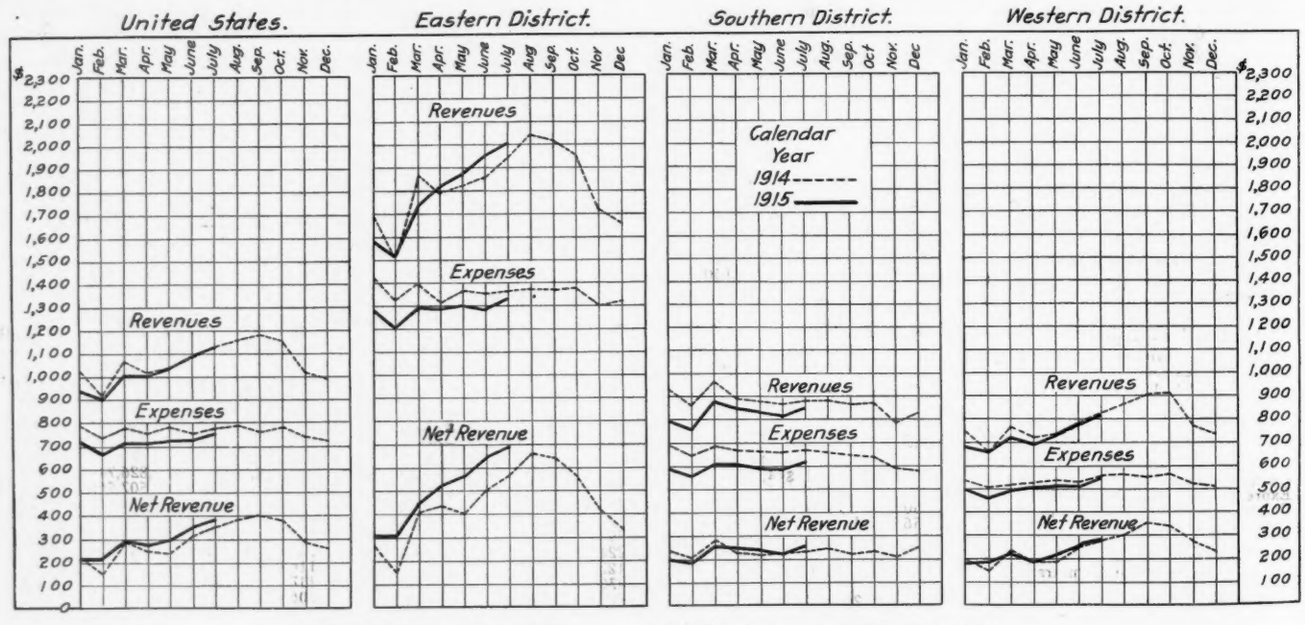
July net operating income per mile was 13.3 per cent greater in 1915 than in 1914, 10.4 per cent greater than in 1913, 7.2 per cent greater than in 1912 and 15.8 per cent greater than in 1911.

Transportation Club of Louisville

The first monthly meeting of the Transportation Club of Louisville, Ky., was held in the Seelbach Hotel in that city on October 19. The address of the evening was made by Samuel O. Dunn, editor of the *Railway Age Gazette*, on the subject of "Government and Business."

Chilled Car Wheel Manufactu rers

At the annual meeting of the Association of Manufacturers of Chilled Car Wheels, held in New York on October 12, officers were re-elected as follows: President and treasurer, George W. Lyndon; vice-presidents, E. F. Carry and J. A. Kilpatrick; secretary George F. Griffin; consulting engineer, F. K. Vial. The board of directors consists of E. F. Carry, J. A. Kilpatrick, W. S. Atwood, Chas. A. Lindstrom, F. K. Vial, A. G. Wellington, W. C. Arthurs, J. D. Rhodes, F. B. Cooley, A. J. Miller and Wm. F. Cutler. An abstract of President Lyndon's address appeared in last week's issue, page 690.



Monthly Revenues and Expenses per Mile of Line in 1914 and 1915

Milwaukee Veterans' Association

A large number of employees and officers of the Chicago, Milwaukee & St. Paul, who had been in the service of the road for 25 years or more, held a meeting at Chicago on October 14, and organized the Milwaukee Veterans' Association. Among those present at the meeting were President A. J. Earling, who began work for the company 52 years ago as a telegraph operator; John C. Fox, of Janesville, Wis., who operated one of the three

locomotives first operated by the road, now a roundhouse foreman, and J. H. Flynn of Chicago, a conductor, who has been in the service of the road for 52 years.

Association of Passenger Traffic Officers

A special meeting of the American Association of Passenger Traffic Officers is to be held at French Lick Springs, Ind., October 26-27. Several suggested means of economy will be discussed and reports received from committees on printing and distribution of folders, on passenger train service, on economical operation of city ticket offices, and on checking of baggage.

General Baggage Agents' Association

The annual convention of the American Association of General Baggage Agents was held at Kansas City, Mo., on October 13 and 14. The meeting was devoted mainly to a discussion of baggage rules. The question of whether the Western roads should adopt the declaration of value as a protection against unlimited liability under the Cummins amendment was discussed but no action taken. Uniform symbols for recording the description of and damage to baggage were adopted for the entire country. It was decided to apoint five standing committees to consider the subjects of standard baggage rules, arbitration, baggage checks; standard forms for office methods and accounting, and telegraph code to which matters pertaining to these subjects will be referred for report. The following officers were elected: President, John F. Dugan, general baggage agent, Baltimore & Ohio, Baltimore, Md.; secretary-treasurer, J. E. Quick, general baggage agent, Grand Trunk, Toronto, Ont. It was decided to hold the next annual meeting at Boston, Mass., on June 21, 1916.

June Mechanical Conventions

A joint meeting of the executive committees of the Master Car Builders' Association, the American Railway Master Mechanics' Association and the Railway Supply Manufacturers' Association will be held at the Hotel Statler, Cleveland, Ohio, Monday, November 15, at 10 a.m. The object of the meeting will be to decide upon the dates for the June conventions, as well as the place of the meetings, and also to discuss other details of the joint work of these three associations. It is planned also to hold separate meetings of the executive committees of each one of the associations after the joint meeting. The meeting is being held at Cleveland because of the illness of President MacBain, of the Master Car Builders' Association, who expects, however, to be sufficiently recovered by November 15 to participate.

Operating Revenues and Expenses of Express Companies for June, 1915

The following statement, which is subject to revision, has been compiled by the Interstate Commerce Commission from the monthly reports of operating revenues and expenses of the principal express companies for June, 1915:

A—FOR THE MONTH OF JUNE

Item	Adams Express Co.		American Express Co.		Canadian Express Co.		Globe Express Co.*		Great Northern Express Co.	
	1915	1914	1915	1914	1915	1914	1915	1914	1915	1914
Mileage of all lines covered (miles)	44,930.22	38,382.94	74,292.79	61,518.83	9,476.50	7,680.31	.....	2,839.78	9,582.80	9,333.29
Charges for transportation.....	$3,188,128	$2,732,546	$4,262,444	$3,555,967	$272,671	$431,186	$5,150	$61,463	$299,022	$302,617
Express privileges—Dr.....	1,496,811	1,520,511	2,131,540	1,747,330	136,491	286,154	2,290	29,759	172,362	171,760
Operations other than transp.....	49,495	35,204	299,237	160,182	5,450	11,867	8	834	4,839	4,503
Total operating revenues.....	1,740,822	1,246,928	2,430,140	1,968,819	141,831	156,900	2,867	32,538	131,499	136,360
Operating expenses	1,529,943	1,483,296	2,120,712	1,982,375	123,239	131,391	2,072	29,706	86,099	101,051
Net operating revenue.....	210,878	236,368	309,428	13,556	13,591	25,508	795	2,831	45,400	35,309
Uncollectible revenue from transp.	516	.....	534	.....	5	.....	.....	.....	20	.....
Express taxes	12,407	22,916	39,392	37,103	7,948	7,249	345	649	3,708	3,908
Operating income	197,954	259,284	269,502	50,659	5,637	18,259	449	2,182	41,671	31,400

Item	Northern Express Co.		Southern Express Co.		Wells Fargo & Co.		Western Express Co.		Total for All Companies Named†	
	1915	1914	1915	1914	1915	1914	1915	1914	1915	1914
Mileage of all lines covered (miles)	8,233.03	8,118.34	34,665.60	33,704.60	114,692.12	99,017.36	5,232.87	5,174.26	301,105.94	296,708.04
Charges for transportation.....	$284,846	$293,910	$1,120,676	$1,198,531	$3,588,923	$2,674,714	$120,119	$107,966	$13,142,193	$12,877,185
Express privileges—Dr.....	152,877	157,547	576,713	611,374	1,832,468	1,386,708	55,469	56,881	6,557,026	6,844,858
Operations other than transp.....	3,869	3,329	22,897	23,782	73,667	61,622	3,451	2,655	462,917	324,717
Total operating revenues.....	135,839	139,692	566,860	610,940	1,830,122	1,349,629	68,100	53,740	7,048,084	6,357,034
Operating expenses	90,320	99,109	514,900	950,376	1,555,857	1,214,324	53,364	51,497	7,051,509	5,621,321
Net operating revenue.....	45,519	40,582	51,960	60,561	274,264	135,304	14,736	2,243	966,575	264,797
Uncollectible revenue from transp.	9	1	67	.....	1,320	.....	12	.....	2,486	2
Express taxes	5,641	10,875	12,922	15,338	30,714	34,426	925	1,109	114,006	146,792
Operating income	39,867	29,705	38,970	45,222	242,229	100,878	13,798	1,134	850,088	411,591

B—FOR THE TWELVE MONTHS ENDING WITH JUNE

Item	Adams Express Co.		American Express Co.		Canadian Express Co.		Globe Express Co.*		Great Northern Express Co.	
	1915	1914	1915	1914	1915	1914	1915	1914	1915	1914
Charges for transportation.....	$34,631,486	$33,242,622	$46,735,415	$41,644,555	$3,117,113	$3,341,340	$601,549	$669,411	$3,138,116	$3,245,470
Express privileges—Dr.....	17,167,041	17,532,432	23,458,860	20,836,894	1,554,427	1,666,472	305,433	286,570	1,903,533	1,970,918
Operations other than transp.....	508,498	370,820	2,387,912	2,143,482	60,570	114,732	8,110	9,882	52,688	50,594
Total operating revenues.....	17,972,943	16,081,010	25,664,467	22,951,142	1,623,255	1,789,599	306,226	342,723	1,287,271	1,325,146
Operating expenses.....	15,068,935	16,642,653	24,660,305	23,214,574	1,536,528	1,661,834	298,630	357,916	1,858,575	1,086,304
Net operating revenue.....	115,992	761,643	1,004,162	263,431	83,726	127,765	7,595	15,193	228,696	238,842
Uncollectible revenue from transp.	6,075	.....	3,149	207	100	.....	.....	.....	123	.....
Express taxes	194,931	203,743	417,934	381,337	51,948	28,949	11,195	12,049	45,155	45,659
Operating income	316,998	965,386	583,078	544,977	31,677	38,816	3,599	27,242	183,417	136,162

Item	Northern Express Co.		Southern Express Co.		Wells Fargo & Co.		Western Express Co.		Total for All Companies Named†	
	1915	1914	1915	1914	1915	1914	1915	1914	1915	1914
Charges for transportation.....	$2,778,592	$3,015,841	$14,085,099	$15,664,012	$38,555,664	$31,353,229	$1,183,707	$1,198,037	$144,826,744	$152,717,014
Express privileges—Dr.....	1,515,586	1,637,573	7,278,117	8,041,709	19,724,414	15,816,159	602,151	661,285	73,507,565	78,216,462
Operations other than transp.....	40,250	38,967	300,382	328,812	794,633	668,765	37,522	28,835	4,131,068	4,052,362
Total operating revenues.....	1,303,256	1,417,236	7,107,864	7,951,115	19,565,882	16,205,855	619,073	565,567	75,450,247	78,552,914
Operating expenses	1,060,617	1,093,203	6,302,800	6,889,890	17,860,839	14,732,252	623,333	598,655	71,493,566	76,951,121
Net operating revenue.....	242,639	324,032	805,063	1,061,224	1,705,043	1,473,602	4,254	28,068	3,956,681	1,601,793
Uncollectible revenue from transp.	204	41	662	127	10,677	.....	114	.....	21,308	377
Express taxes	60,541	60,375	172,957	181,438	413,293	462,425	11,887	10,836	1,379,994	1,470,541
Operating income	381,792	263,615	631,443	879,608	1,280,572	1,071,178	16,206	38,904	2,555,479	138,873

* Discontinued operations April 30, 1915.
† Figures for 1914 include returns of United States Express Co., which ceased operations as of June 30, 1914.

American Association of Railway Surgeons

The twelfth annual meeting of the American Association of Railway Surgeons was held at the Hotel Sherman, Chicago, on October 13, 14 and 15. President George F. Beasley, surgeon of the Chicago, Indianapolis & Louisville and the Cleveland, Cincinnati, Chicago & St. Louis, at Lafayette, Ind., presided. In addition to a large number of papers and discussions on technical medical and surgical subjects, one session of the meeting was devoted to papers and discussions on "The Railway Surgeon and His Work," which included the following papers: "The Local

Surgeon and His Duties," by G. W. Pirtle, surgeon, Chicago & Eastern Illinois, Carlisle, Ind.; "Some Vexations of the Railway Surgeon," by E. T. Easley, surgeon of the Chicago, Indianapolis & Louisville at New Albany, Ind.; "Accidents and How to Prevent Them," by B. M. Hart, surgeon of the Chicago & North Western at Blunt, S. D.; "Railway Accidents in the Country and Care of the Injured," by W. J. Ragan, surgeon of the Chicago & North Western at Shawano, Wis., and "A Plea for Scientific First Aid," by John S. McAtee, surgeon of the Illinois Central at Council Bluffs, Iowa.

The following were elected officers for the ensuing year: F. T. Fort, surgeon Illinois Central, Louisville, Ky.; vice-presidents, J. M. Dodd, Minneapolis, St. Paul & Sault Ste. Marie, Ashland, Wis.; E. H. Griswold, Wabash, Peru, Ind.; C. P. Frantz, Chicago, Burlington & Quincy, Burlington, Iowa; treasurer, H. B. Jennings, Chicago, Rock Island & Pacific, Council Bluffs, Iowa; secretary-editor, Louis J. Mitchell, Chicago, Milwaukee & St. Paul, Chicago, Ill.

Association of Railway Electrical Engineers

The eighth annual convention of the Association of Railway Electrical Engineers was held at the La Salle Hotel, Chicago, October 19, 20, 21 and 22, H. C. Meloy, New York Central (West), presiding. The following is a list of the exhibitors at the Convention:

Adams & Westlake Company, Chicago—Straight and drop handle car brake, roundhouse headlight and lighting fixtures. Represented by W. J. Piersen, A. S. Anderson, G. L. Walters and J. F. Stender.

American Pulley Company, Philadelphia, Pa.—Axle pulleys. Represented by C. P. Englehart and J. F. Forrest.

Albert & J. M. Anderson Manufacturing Company, Boston, Mass.—Plugs and receptacles. Represented by W. W. Hincher.

Benjamin Electric Manufacturing Company, Chicago—Reflectors and lighting fixtures. Represented by H. E. Watson, J. B. Weber and A. Aelubeck.

Central Electric Company, Chicago—Okonite wires and cables, Ralco receptacles and plugs, Maxolite reflectors, fans and other car lighting fixtures. Represented by J. M. Lorenz, L. G. Martin, D. Woodhead, E. C. Wilson, R. N. Baker and A. L. McNeil.

Consolidated Railway Electric Lighting & Equipment Company, New York—Regulator panels and dynamo.

Crouse-Hinds Company, Syracuse, N. Y.—Condolets, panel boards and roundhouse headlights. Represented by A. F. Hills, C. H. Bissell, E. G. Smith, M. J. Kiefer, F. F. Skell, Walter Fagan, C. Dubsky, E. C. Otto and C. N. Crowfoot.

Cutter Company, George, South Bend, Ind.—Switchboards and lighting fixtures. Represented by O. B. Duncan and F. L. Curl.

Darling-Henrici Manufacturing Company, New York—Locomotive headlights. Represented by L. A. Darling and M. S. Jordan.

Edison Storage Battery Company, Orange, N. J.—Storage batteries. Represented by H. G. Thompson, W. F. Bauer, E. V. McGinness and C. A. Luckey.

Electric Storage Battery Company, Philadelphia, Pa.—E S B axle lighting outfit and panel switchboards. Represented by G. H. Atkin, J. Lester Woodbridge, H. M. Beck, H. E. Hunt and O. R. Shortall.

General Electric Company, Schenectady, N. Y.—Lighting cable, testing instruments and arc-welding sets. Represented by B. F. Bilsland, R. H. Parker, S. W. McCune, Jr., J. Scribner and C. C. Bailey.

Gould Coupler Company, New York.—Regulating panel, generator and lead battery accessories. Rrepresented by G. R. Berger and J. W. Jepson.

Harter Manufacturing Company. Chicago.—Lighting fixtures. Represented by G. A. Harter, W. M. Soffe and D. E. Warrel.

Hart & Hegeman Manufacturing Company, Hartford, Conn.—Paiste switches and taplets. Represented by H. L. Everest, Jr., W. W. Winship and F. C. Church.

Kerite Insulated Wire & Cable Company, New York.—Wire and cables. Represented by B. L. Winchell, Jr., W. N. Fenley and J. A. Hamilton.

Krantz Mfg. Company, Brooklyn, N. Y.—Lighting and control panels with safety switches and automatic emergency relay switch. Represented by I. A. Bennett.

National Lamp Works of General Electric Company, Cleveland, Ohio.—Mazda lamps. Represented by A. M. Klingman and L. C. Kent.

National Metal Molding Company, Pittsburgh, Pa.—Metal molding, Sherardized conduit, Flex-steel conduit, outlet boxes and a complete line of fittings for these devices. Represented by H. C. Moran and J. A. Bennett.

Oneida Steel Pulley Company, Oneida, N. Y.—Corrugated bushing axle pulley. Represented by N. G. Stark.

Pyle National Electric Headlight Company, Chicago.—Arc and incandescent headlights. Represented by W. Miller, Crawford P. McGinnis, J. Will Johnson, and W. T. Bretherton.

Safety Car Heating & Lighting Company, New York.—Underframe axle equipment, regulating devices and car lighting fixtures. Represented by C. A. Pinyerd, A. C. Moore, H. E. Hulse, J. H. Rodger and W. I. Thompson.

Sangamo Electric Company, Springfield, Ill.—Recording ampere hour meters and circuit breakers. Represented by C. H. Koehler, M. B. Southwick, J. T. Hartley and T. M. Torzillo.

Schroeder Headlight Company, Evansville, Ind.—Sunbeam headlights, 32-volt and 6-volt incandescent generators. Represented by J. Henry Schroeder and E. H. Werzener.

Standard Underground Cable Company, Pittsburgh, Pa.—Cable and fittings. Represented by E. J. Pietzcker, W. M. Rogers, Elbert J. Norton and H. K. Weld.

United States Light & Heating Corporation, New York.—Car lighting generators, panels, batteries and various parts of lighting apparatus. Represented by C. C. Bradford, R. C. Haley, John Roedell, H. A. Mathews, R. E. Stuntz and O. A. Schlesinger.

Western Electric Company, New York.—Loud-speaking telephone receiver, lamps and portable telephones. Represented by J. C. Benning and George H. Porter.

Westinghouse Lamp Company, New York.—Mazda locomotive headlight lamps. Represented by W. H. Rolandson, A. N. Brown and J. G. Harvey.

Willard Storage Battery Company, Cleveland, Ohio.—No-wash type train lighting batteries and accessories. Represented by L. Sears, W. E. Ballantine, R. M. Newbold and E. L. Myers.

MEETINGS AND CONVENTIONS

The following list gives names of secretaries, date of next or regular meetings, and places of meeting of those associations which will meet during the next three months. The full list of meetings and conventions is published only in the first issue of the Railway Age Gazette for each month.

AMERICAN ASSOCIATION OF PASSENGER TRAFFIC OFFICERS.—W. C. Hope, C. R. R. of N. J., 143 Liberty St., New York. Next meeting, October 26-27, 1915, French Lick Springs Hotel, French Lick Springs, Ind.

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 75 Church St., New York. Next meeting, November 17, 1915, Chicago.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—Chas. Warren Hunt, 220 W. 57th St., New York. Regular meetings, 1st and 3d Wednesday in month, except July and August, 220 W. 57th St., New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York. Annual meeting, December 7-10, 1915, New York.

ASSOCIATION OF RAILWAY ELECTRIC ENGINEERS.—Jos. A. Andreucetti, C. & N. W., Room 411, C. & N. W. Sta., Chicago. Annual meeting, October 18-24, 1915, Chicago.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 75 Church St., New York. Next meeting, December 14-15, 1915, St. Louis, Mo.

BRIDGE AND BUILDING SUPPLY MEN'S ASSOCIATION.—L. D. Mitchell, Detroit Graphite Co., Chicago, Ill. Meetings with American Railway Bridge and Building Association.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk, P. O. Box 7, St. Lambert (near Montreal), Que. Regular meetings, 2d Tuesday in month, except June, July and August, Windsor Hotel, Montreal, Que.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 176 Mansfield St., Montreal, Que. Regular meetings, 1st Thursday in October, November, December, February, March and April. Annual meeting, January, Montreal.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 Lawlor Ave., Chicago. Regular meetings, 2d Monday in month, except June, July and August, Hotel La Salle, Chicago.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York. Regular meetings, 2d Friday in January, May, September and November. Annual meeting, 2d Thursday in March, Hotel Statler, Buffalo, N. Y.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—Elmer K. Hiles, 2511 Oliver Bldg., Pittsburgh, Pa. Regular meetings, 1st and 3d Tuesday, Pittsburgh.

GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—A. M. Hunter, 321 Grand Central Station, Chicago. Regular meetings, Wednesday, preceding 3d Thursday in month, Room 1856, Transportation Bldg., Chicago.

MAINTENANCE OF WAY AND MASTER PAINTERS' ASSOCIATION OF THE UNITED STATES AND CANADA.—T. I. Goodwin, C. R. I. & P., Eldon, Mo. Next meeting, October 19-21, 1915, St. Louis, Mo.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic Ave., Boston, Mass. Regular meetings, 2d Tuesday in month, except June, July, August and September, Boston.

NEW YORK RAILROAD CLUB.—Harry D. Vought, 95 Liberty St., New York. Regular meetings, 3d Friday in month, except June, July and August, 29 W. 39th St., New York.

NIAGARA FRONTIER CAR MEN'S ASSOCIATION.—E. N. Frankenberger, 623 Brisbane Bldg., Buffalo, N. Y. Meetings, 3d Wednesday in month, New York Telephone Bldg., Buffalo, N. Y.

PEORIA ASSOCIATION OF RAILROAD OFFICERS.—M. W. Rotchford, 410 Masonic Temple Bldg., Peoria, Ill. Regular meetings, 3d Thursday in month, Jefferson Hotel, Peoria.

RAILROAD CLUB OF KANSAS CITY.—Claude Manlove, 1008 Walnut St., Kansas City, Mo. Regular meetings, 3d Saturday in month, Kansas City.

RAILROAD MEN'S IMPROVEMENT SOCIETY.—J. B. Curran, Erie R. R., 50 Church St., New York. Meetings, alternate Thursdays, October to May, Assembly Rooms of Trunk Line Association, 143 Liberty St., New York.

RAILWAY BUSINESS ASSOCIATION.—Frank W. Noxon, 30 Church St., New York. Annual meeting, December, 1915. Waldorf-Astoria Hotel, New York.

RAILWAY CLUB OF PITTSBURGH.—J. B. Anderson, Room 207, P. R. R. Sta., Pittsburgh, Pa. Regular meetings, 4th Friday in month, except June, July and August, Monongahela House, Pittsburgh.

RAILWAY ELECTRICAL SUPPLY MANUFACTURERS' ASSOCIATION.—J. Scribner, 1063 Monadnock Block, Chicago. Meetings with Association of Railway Electrical Engineers.

RICHMOND RAILROAD CLUB.—F. O. Robinson, C. & O., Richmond, Va. Regular meetings, 2d Monday in month, except June, July and August.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo. Regular meetings, 2d Friday in month, except June, July and August, St. Louis.

SALT LAKE TRANSPORTATION CLUB.—R. E. Rowland, David Keith Bldg., Salt Lake City, Utah. Regular meetings, 1st Saturday of each month, Salt Lake City.

SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Grant Bldg., Atlanta, Ga. Regular meetings, 3d Thursday, January, March, May, July, September, November, 10 A. M., Piedmont Hotel, Atlanta.

TOLEDO TRANSPORTATION CLUB.—Harry S. Fox, Toledo, Ohio. Regular meetings, 1st Saturday in month, Boody House, Toledo.

TRAFFIC CLUB OF NEWARK.—John J. Kautzmann, P. O. Box 238, Newark, N. J. Regular meetings, 1st Monday in month, except July and August, The Washington, 559 Broad St., Newark.

TRAFFIC CLUB OF CHICAGO.—W. H. Wharton, La Salle Hotel, Chicago.

TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 291 Broadway, New York. Regular meetings, last Tuesday in month, except June, July and August, Waldorf-Astoria Hotel, New York.

TRAFFIC CLUB OF PITTSBURGH.—D. L. Wells, Gen'l Agt., Erie R. R., 1924 Oliver Bldg., Pittsburgh, Pa. Meetings bi-monthly, Pittsburgh.

TRAFFIC CLUB OF ST. LOUIS.—A. F. Versen, Mercantile Library Bldg., St. Louis, Mo. Annual meeting in November. Noonday meetings October to May.

TRANSPORTATION CLUB OF DETROIT.—W. R. Hurley, Superintendent's office, N. Y. C. R. R., Detroit, Mich. Meetings monthly, Normandie Hotel, Detroit.

WESTERN CANADA RAILWAY CLUB.—L. Kon, Immigration Agent, Grand Trunk Pacific, Winnipeg, Man. Regular meetings, 2d Monday, except June, July and August, Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, 1112 Karpen Building, Chicago. Regular meetings, 3d Tuesday in month, except June, July and August, Karpen Bldg., Chicago.

WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, 1735 Monadnock Block, Chicago. Regular meetings, 1st Monday in month, except January, July and August, Chicago. Extra meetings, except in July and August, generally on other Monday evenings. Annual meeting, 1st Wednesday after 1st Thursday in January, Chicago.

UTAH SOCIETY OF ENGINEERS.—Frank W. Moore, 1111 Newhouse Bldg., Salt Lake City, Utah. Regular meetings, 3d Friday in month, except July and August, Salt Lake City.

REVENUES AND EXPENSES OF RAILWAYS

MONTH OF AUGUST, 1915

Name of Road.	Average mileage operated during period.	Operating revenues			Operating expenses							Net from railway operation.	Railway tax accruals.	Operating income (or loss).	Increase (or decr.) comp. with last year.
		Freight.	Passenger.	Total (inc. misc.)	Maintenance of Way and structures.	Maintenance of Equipment.	Traffic.	Transportation.	Miscellaneous.	General.	Total.				
Atlantic City	170	$80,558	$297,551	$390,209	$24,362	$24,145	$6,160	$152,183	$105	$2,217	$209,172	$181,037	$10,000	$170,980	—$11,059
Belt Railway Co. of Chicago	24	.....	.....	216,842	13,784	26,522	493	89,293	.....	5,381	135,473	81,368	10,758	70,610	—63,672
Central of Georgia	1,924	527,885	273,089	899,997	135,024	168,475	35,786	323,619	819	38,336	701,249	198,748	51,358	146,719	—22,219
Delaware & Hudson Co.—R. R. Dept.	886	1,643,336	352,992	2,130,303	160,226	321,091	26,873	652,123	23,861	62,288	1,247,043	883,258	56,500	826,758	—30,837
Kansas City, Mexico & Orient	737	151,144	38,216	200,378	59,349	48,345	8,671	86,066	.....	9,313	211,745	—11,367	10,110	—21,477	—26,852
Missouri Pacific	3,931	1,756,269	522,560	2,502,841	364,824	582,983	70,761	835,826	12,806	72,181	1,939,050	563,791	99,418	461,938	—167,765
Philadelphia & Reading	1,120	3,360,921	576,944	4,144,299	377,452	876,392	51,128	1,365,362	11,729	65,146	2,745,642	1,398,657	100,654	1,297,697	59,316
Port Reading	21	102,504	.....	128,592	10,928	11,945	38	42,709	.....	354	65,972	62,620	10,000	52,620	18,653
Rutland	468	161,890	125,611	327,198	46,649	55,652	9,843	104,883	1,129	5,183	223,338	103,859	16,861	86,998	10,949
St. Joseph & Grand Island	258	87,869	31,966	129,496	26,961	25,422	4,356	44,763	.....	5,152	106,655	22,842	7,620	15,147	6,105
St. Louis, Iron Mountain & Southern	3,363	1,952,954	474,264	2,608,518	364,167	610,684	64,215	701,707	7,137	64,194	1,811,807	796,711	110,935	683,339	—78,570
St. Louis Southwestern	943	422,372	117,285	576,520	49,669	98,574	25,607	154,048	3,574	24,322	355,596	220,924	30,492	190,199	—20,402
St. Louis & San Francisco	4,750	2,376,801	1,003,444	3,604,001	578,380	515,809	64,165	1,133,769	.....	83,255	2,348,595	1,255,406	117,491	1,136,637	4,255
St. Louis, Brownsville & Mexico	548	146,807	74,273	241,079	32,577	38,118	5,106	62,947	.....	10,529	148,939	92,140	6,500	85,415	19,663
St. Louis, Merchants' Bridge Terminal	9	.....	195	156,385	16,721	8,189	735	69,578	.....	5,087	100,311	56,075	6,540	49,535	1,488
St. Louis, San Francisco & Texas	244	56,600	22,456	85,605	24,087	15,064	1,920	38,765	.....	5,311	85,146	459	1,216	—860	6,600
St. Louis Southwestern of Texas	811	177,906	84,434	285,675	59,063	81,883	12,021	133,654	606	17,355	294,231	—8,556	15,032	—23,733	6,312
San Antonio & Aransas Pass	Pass. 724 / Frt. 724	207,434	102,248	335,082	62,995	56,641	6,701	147,559	.....	11,661	285,504	49,578	15,732	33,846	693
San Pedro, Los Angeles & Salt Lake	1,132	488,789	369,700	958,193	81,069	128,829	32,994	255,463	29,024	16,892	544,270	413,922	51,292	362,604	165,438
Seaboard	3,123	1,038,542	385,821	1,576,580	214,181	254,116	57,501	553,317	7,851	57,999	1,144,965	431,615	92,251	338,763	—24,255
Southern	7,022	3,300,676	1,573,237	5,311,892	700,675	893,534	156,677	1,767,504	27,774	157,013	3,690,312	1,621,580	228,233	1,390,639	285,487
Southern Pacific	6,928	5,633,571	3,872,790	10,571,661	1,075,074	1,411,703	188,761	2,989,412	225,439	215,089	6,090,727	4,480,933	413,035	4,065,538	1,255,070
Spokane, Portland & Seattle	556	227,999	197,780	466,785	42,324	35,888	9,059	92,012	4,298	12,059	195,374	271,410	53,400	217,928	14,430
Staten Island Rapid Transit Co.	11	39,960	33,798	110,601	6,097	3,988	734	37,924	.....	2,548	51,291	59,310	5,000	54,310	6,699
Tennessee Central	294	89,236	36,034	132,214	27,849	13,967	5,151	46,403	.....	6,568	99,939	32,275	4,935	26,979	3,111
Terminal R. R. Ass'n of St. Louis	35	.....	221	227,434	18,316	14,385	848	74,878	.....	2,891	111,318	116,117	27,334	88,776	—19,041
Texas & Pacific	1,944	946,310	368,339	1,422,680	175,089	254,096	39,058	557,258	13,033	39,967	1,075,663	347,017	72,000	274,487	3,301
Texas and New Orleans	468	211,343	91,841	331,247	51,666	71,492	6,405	120,954	7,287	10,650	268,419	62,828	18,335	44,179	16,644
Toledo & Ohio Central	436	331,082	58,361	418,381	64,219	75,314	7,173	140,316	1,758	9,136	297,916	120,465	21,003	99,463	—100,028
Toledo, Peoria & Western	248	63,871	41,470	110,618	17,375	26,445	1,905	39,745	.....	3,589	89,059	21,560	6,100	15,460	—4,507
Toledo, St. Louis & Western	451	373,790	42,807	444,466	49,221	82,208	15,315	138,112	.....	8,051	292,907	151,560	17,400	134,160	19,776
Ulster & Delaware	129	43,690	65,133	127,073	13,028	11,437	2,147	45,509	53	2,674	74,848	52,225	3,500	48,726	8,263
Union Pacific	3,617	3,267,860	1,117,596	4,907,941	670,385	599,039	122,479	1,139,480	98,233	113,087	2,739,640	2,168,300	197,496	1,969,931	—127,818
Union R. R. of Baltimore	9	111,707	21,294	134,597	15,462	.....	.....	4,460	.....	2,104	22,026	112,571	5,806	106,766	—608
Union R. R. of Pennsylvania	31	.....	.....	532,719	34,103	92,353	105	160,435	.....	2,861	289,857	242,862	8,500	234,362	143,139
Vandalia	910	649,780	211,859	980,609	142,627	174,715	23,215	329,255	9,459	23,147	702,454	278,155	38,252	239,721	12,280
Vicksburg, Shreveport & Pacific	171	65,875	37,990	116,027	19,905	26,513	3,241	39,796	2,127	4,489	96,071	19,955	8,100	11,856	—1,986
Virginia & Southwestern	240	133,456	14,667	152,719	25,726	33,186	2,071	40,917	.....	3,391	105,292	47,427	6,667	40,761	—11,305
Virginian	504	542,968	44,114	622,197	70,484	97,606	5,281	117,672	12,412	13,709	311,775	310,422	21,500	288,916	56,846
Wabash	2,519	1,941,168	639,327	2,813,256	363,959	408,826	81,665	972,207	16,462	61,099	1,903,694	909,562	82,309	826,735	62,907
Washington Southern	36	37,715	41,903	105,515	9,982	11,482	1,443	36,175	1,147	3,054	63,282	42,234	3,540	38,687	17,384
West Jersey & Seashore	356	224,803	224,806	1,018,421	115,859	111,974	12,593	284,337	3,662	13,649	542,075	476,347	28,742	447,585	—12,408
Western Pacific	941	320,651	340,278	722,592	115,076	61,960	23,018	194,074	24,705	17,453	436,285	286,306	30,501	255,761	161,018
Western Maryland	664	757,784	112,638	906,674	106,246	144,102	22,245	290,908	5,386	18,496	587,383	319,291	27,000	292,291	90,872
Western Ry. of Alabama	133	46,426	35,777	93,197	16,591	21,371	5,714	28,283	2,827	4,319	79,105	14,091	5,113	8,432	1,995
Wheeling & Lake Erie	512	553,937	66,197	667,793	100,570	100,819	10,209	188,666	1,417	13,467	415,148	252,645	33,830	218,807	101,586
Yazoo & Mississippi Valley	1,382	762,041	188,502	996,254	171,177	165,501	17,394	325,014	1,337	26,259	706,549	289,706	50,000	239,589	69,369

TWO MONTHS OF FISCAL YEAR, ENDING JUNE 30, 1916.

Name of road.	Average mileage operated during period.	Operating revenues			Operating expenses							Net from railway operation.	Railway tax accruals.	Operating income (or loss).	Increase (or decr.) comp. with last year.
		Freight.	Passenger.	Total (inc. misc.)	Maintenance of Way and structures.	Maintenance of Equipment.	Traffic.	Transportation.	Miscellaneous.	General.	Total.				
Atlantic City	170	$159,889	$568,575	$750,470	$47,984	$48,317	$8,404	$297,201	$185	$5,952	$408,039	$342,432	$20,000	$322,375	—$565
Belt Railway Co. of Chicago	24	.....	.....	456,069	30,464	52,191	1,163	185,854	.....	11,301	280,974	175,095	21,517	153,578	—101,524
Central of Georgia	1,924	1,154,733	549,648	1,887,824	280,620	337,024	71,656	670,848	1,986	78,160	1,439,130	448,694	102,748	344,966	—81,899
Delaware & Hudson Co.—R. R. Dept.	886	3,286,019	638,205	4,175,452	326,695	615,365	60,998	1,291,184	40,079	126,862	2,459,572	1,715,880	113,000	1,602,880	75,637
Kansas City, Mexico & Orient	737	311,273	70,695	403,308	115,267	92,810	17,386	177,137	.....	18,261	420,861	—17,553	20,110	—37,663	—99,941
Missouri Pacific	3,931	3,389,137	1,019,317	4,834,091	706,243	1,056,011	130,659	1,706,888	24,862	158,999	3,782,783	1,051,308	198,836	848,489	—413,041
Philadelphia & Reading	1,120	6,603,268	1,136,566	8,152,705	743,596	1,602,228	89,482	2,698,452	23,022	136,406	5,289,692	2,863,012	201,320	2,660,920	343,183
Port Reading	21	202,899	.....	258,282	23,235	23,183	77	81,070	.....	461	128,022	130,260	20,000	110,260	33,720
St. Louis, Iron Mountain & Southern	3,363	3,735,442	938,262	5,040,567	716,757	1,129,810	129,195	1,459,559	13,929	122,420	3,570,847	1,469,720	221,870	1,243,517	—295,461
St. Joseph & Grand Island	258	165,866	59,359	245,652	53,087	49,262	8,763	88,071	.....	10,114	209,297	36,355	15,240	21,040	—56,866
St. Louis & San Francisco	4,750	4,585,850	1,938,333	6,962,560	1,113,960	1,053,419	126,786	2,199,567	.....	189,105	4,637,057	2,325,503	234,981	2,087,007	—1,946
St. Louis, Brownsville & Mexico	548	255,301	133,152	424,385	66,280	58,361	10,282	128,075	.....	20,067	282,488	141,897	13,000	127,885	26,830
St. Louis, Merchants' Bridge Terminal	9	.....	330	296,742	34,862	17,201	1,509	137,906	.....	12,170	203,648	93,095	13,080	80,015	—3,390
St. Louis, San Francisco & Texas	244	125,786	44,771	197,644	46,364	30,213	3,845	79,688	.....	9,329	169,439	28,204	2,432	25,670	—9,868
St. Louis Southwestern of Texas	811	426,023	165,295	639,884	108,331	149,367	26,699	271,920	1,256	33,381	566,304	73,580	30,057	43,275	99,086
St. Louis Southwestern	943	826,088	224,292	1,123,938	90,095	196,544	51,044	306,220	7,027	47,329	697,949	425,989	60,213	364,901	—28,781

Traffic News

The New York state canals are to be closed at midnight, November 30, unless sooner closed by ice.

The ocean-going ferry, Henry M. Flagler, carrying freight cars between Key West and Havana, is being worked to its full capacity and officers of the Florida East Coast say that the facilities will soon be increased by the addition of another boat. It is proposed to build a vessel with a capacity of 38 cars. The Henry M. Flagler carries 28 cars.

The Chicago, Milwaukee & St. Paul Railway has issued a booklet, entitled "New Towns and Business Opportunities," containing a list of the industrial, business and professional openings existing in the towns and cities along the St. Paul's line, together with valuable information concerning the population and the existing state of business development.

The annual meeting of the National Industrial Traffic League will be held at the Congress Hotel, Chicago, on November 17 and 18. The annual dinner is to be held on the evening of Wednesday, November 17. The speakers will be George T. Buckingham, president, Chicago branch, National Security League, and E. J. McVann, manager traffic bureau, Commercial Club of Omaha, Neb.

According to the Canal Record, on October 5, there were 83 vessels tied up in the Panama Canal on account of the slides at Culebra, awaiting passage. Of these 45 were on the Atlantic side with an aggregate of approximately 167,000 tons of cargo, and 38 were on the Pacific side with approximately 189,000 tons of cargo. A number of boats which had intended passing through the canal are taking their cargoes around via the Straights of Magellan.

The railroads terminating at Hampton Roads, Virginia,—the Norfolk & Western, the Chesapeake & Ohio and the Virginian —announce that after January 1, 1916, the freight rates on coal from the mines to tide water, when intended for use as fuel on vessels, will be advanced from $1.40 a ton to $1.50. The lower rate is that on export coal and the advance is in accordance with the Interstate Commerce Commission's ruling that coal to be used on the vessels must not be treated as export freight.

The results of the diversified farming campaign conducted by the St. Louis, Iron Mountain & Southern are now becoming manifest. Already this season 41 cars of wheat have been received from stations on the Arkansas, Memphis and Valley divisions which heretofore have shipped no wheat and where many thought it could not be successfully grown. In all about 225 cars of the grain have been shipped from the cotton territory of Arkansas, and millers pronounce it the equal of any for commercial milling. Four parishes alone along the Iron Mountain, in Northeast Louisiana, raised over 1,500,000 bushels of oats this year, and the farmers had little difficulty in selling their entire surplus for an average of about 42 cents a bushel. Twenty-seven cars of corn have been received from stations on the Arkansas, Louisiana and Valley divisions, which last year supplied only two cars. The United States Department of Agriculture estimates that the 1915 corn crop in Arkansas and Louisiana will be about 36,000,000 bushels in excess of that produced in 1914. D. C. Welty, commissioner of agriculture, has posted in waiting rooms a large placard on marketing corn. It gives valuable information as to gathering the grain, storing it on the farm, fumigating it for weevils, preparing it for market and grading it.

The Florida State Board of Health is having built, by the Pullman Company, three cars to be used for a traveling exhibition of the board throughout the state. Two of the cars will be used for models, photographs, exhibits, apparatus, moving picture outfit and everything connected with this line of work. It is the plan of the board to equip these cars, using the third for living purposes, and to traverse the state, giving exhibitions of first-aid to injured, prevention of disease, clean living methods, and everything pertaining to health operations for the benefit of the young.

Commission and Court News

INTERSTATE COMMERCE COMMISSION

Rates on Salt from St. Clair, Mich.

Diamond Crystal Salt Company v. Michigan Central, et al. Opinion by Commissioner McChord.

The commission holds that a through rate of 67.4 cents per 100 lb. on salt in car loads from St. Clair, Mich., to California terminals is not unreasonable or discriminatory and dismisses the complaint. (36 I. C. C., 172.)

Switching Charges at South Omaha, Neb.

Opinion by Commissioner Daniels.

The commission finds that the railroad operated by the Union Stock Yards Company of Omaha, Neb., between the transfer tracks of the carriers and certain industries, etc., has justified an increase from $1 to $6 for switching livestock between connecting lines and private chutes of packing houses and an increase from $2 to $3 for switching dead freight between connecting lines and other departments of the stockyards company and for switching dead freight as an intermediate carrier between the connecting lines. A proposed increase from $2 to $3 for switching dead freight to non-proprietary interests on respondent's line.

Figures were offered to show that the carrier was not earning sufficient return on its investment, but these were not sufficiently accurate and the commission held that even in case the earnings on the railroad property were shown to afford an inadequate return on the investment, the question would arise whether the increase should be sought mainly from dead freight in which the respondent is interested only as a carrier or from livestock in which the respondent is interested not only as a carrier but as the proprietor of a stockyard. (36 I. C. C., 198.)

The Extension of Credit to Consignees

American Coal & Coke Company v. Michigan Central. Opinion by Commissioner Clements.

The complainant, a coal company in Detroit, alleges that it is discriminated against by the action of the carrier in refusing to extend credit to it for freight and demurrage charges on coal in carloads consigned to it at Detroit, while extending such credit to its competitors. The situation was somewhat complicated by the refusal of a number of dealers, including the complainant, to pay demurrage charges on coal consigned to Detroit and held at Windsor, Ont. The complainant, however, had also been delinquent in its payments on other charges than the demurrage in question and suit had been brought against it by the carrier, although no suits had been brought against other dealers who had refused to pay demurrage. The commission holds as follows: The complainant appears to have refused to pay any demurrage charges, whenever and however accruing. This put complainant in a different attitude from that of other patrons and left the defendant no other reasonable alternative but to demand payment of its lawful charges before delivery of the freight. The fact that suit was commenced against the complainant and not against its competitors, does not prove undue prejudice within the meaning of the act. The obligation, under penalties of the law, is upon the defendant to collect its established charges from all by such lawful methods as may be suitable and necessary for the purpose. (36 I. C. C., 195.)

Lateral Allowances on Shipments of Anthracite Coal

In re allowances on anthracite coal at Hauto and Nesquehoning, Pa. Opinion by Commissioner McChord:

The commission in this case orders the Central of New Jersey to cancel tariffs in issue proposing to pay to the Lehigh Coal & Navigation Company certain lateral allowances out of the rates on shipments of anthracite coal from Hauto and Nesquehoning, Pa. These allowances were considered in *Rates for transportation of anthracite coal* (35 I. C. C., 220), reported

in the *Railway Age Gazette* of August 20, 1915, page 314. The Lehigh Coal & Navigation Company leases to the Central of New Jersey the lines of the Lehigh & Susquehanna Railway, for which the New Jersey Central has paid upwards of 10 per cent yearly. The Central of New Jersey in addition has transported coal for the coal company at reductions of from 11 to 23 cents below tariff rates. These so-called lateral allowances result from the tenth covenant of the lease, in which it is provided that on coal delivered by the Navigation company on sidings at the northern end of the Nesquehoning tunnel the rates should not exceed the rates from Penn Haven. The carrier, however, has published in tariff form a higher basis of rates on this traffic and at the close of the month has paid back the allowances mentioned. In the anthracite case the commission held that "the payment of the allowances is an unlawful discrimination against competing shippers, who are charged the full tariff rates," and that "even if the amounts of these allowances were published, their payment is the payment of a rebate, and hence unlawful. But, since these allowances were not published, their payment is also clearly unlawful as being a departure from the published tariffs." These findings are now reaffirmed. (36 I. C. C., 166.)

Loss and Damage Claims on Eggs Delivered at New York City Piers

New York Mercantile Exchange, et al v. Baltimore & Ohio et al. Opinion by Commissioner Daniels.

Complaint is made against the reasonableness of the carriers' rules relating to the delivery of eggs in the metropolitan district of New York. The rules of the Baltimore & Ohio are typical and are as follows:

> Where cases of eggs are received at shipping point and receipted for on other than order bills of lading as in apparent good order (contents and condition of contents of package unknown) and arrive at destination in the same apparent good condition and show no external evidence of damage, no inspection of the contents of such cases will be permitted before delivery thereof to the consignee, and the consignee will be required to accept and receipt for same subject to the same conditions under which the shipment was received for transportation, viz., as in apparent good order (contents and condition of contents of packages unknown).
>
> Where cases show external evidence of damage, consignee shall have the privilege of inspecting the contents of such damaged cases, such inspection to be made jointly with carrier's representative and receipt taken in accordance with the actual ascertained condition of the property.

These rules were put in force largely as a result of abuse in the matter of loss and damage claims whereby some of the carriers were obliged to pay as much as from 20 to 60 per cent of their total revenue on this traffic in claims.

The commission holds: The rule in vogue delimits investigation at docks, piers and stations to cases showing external evidence of damage. The demand for investigation at docks, piers and stations of all cases is precluded by considerations of time, space and cost. The rule simply requires of consignees that where external evidence of damage is absent they receipt for the cases in the same terms as the carrier receipted for the cases when offered for shipment, and can not be said to be unjust or unreasonable.

The enforcement of the rules in issue is cared for by the inspection bureau of the Trunk Line Association. The commission finds no reason why the carriers at a common terminal may not intrust to a joint agent work allotted elsewhere to a carriers' immediate employees. (36 I. C. C., 156.)

STATE COMMISSIONS

The Texas Railroad Commission has issued a notice that it will hear arguments in the advance rate case on October 26.

Wells, Fargo & Co. have filed with the Railroad Commission of California a petition for a rehearing to set aside the order of the commission of September 10, denying its application to increase its rates in California for transportation of merchandise.

The Illinois Public Utilities Commission has announced a series of hearings on the tariffs filed by the railroads, advancing freight rates in the state five per cent, to correspond with the advances allowed by the Interstate Commerce Commission last December. The tariffs have been suspended several times by the state commissions. The first hearing will be held on November 9, and four days will be devoted to a general presentation of the case, including financial and accounting matters. Other days will be devoted to evidence on specific commodities, the hearings to be concluded on January 13.

The California Railroad Commission has issued a circular to shippers, stating that during the next few months a great number of cars will be required to handle California traffic, and that transportation lines fear that the extremely heavy eastbound carload business to be handled will materially affect the number of cars which will be available for local traffic. The commission therefore urges that all shippers and receivers of freight in carload lots use every effort to load and unload cars in the shortest time possible, and wherever practicable to load cars to their full capacity, thereby reducing the number of cars required.

COURT NEWS

The California Supreme Court holds that a railroad employee who was killed while in a roundhouse repairing a switching engine which had been withdrawn from service in the operating department three days before the accident, and was not returned to service until three days afterwards, and which was one of many such engines used both for intrastate and interstate commerce, but 70 per cent of the work of which was interstate commerce, was engaged in interstate commerce within the act, and therefore the case was not within the jurisdiction of the state accident board.—Southern Pacific v. Pillsbury (Cal.), 151 Pac. 277.

Flooding Land—"Unprecedented Flood"

The Alabama Supreme Court holds that a railroad company, constructing and maintaining an embankment with a culvert of sufficient size to carry off the water from ordinary rainfall, is not liable for overflowing the land of another because of the insufficiency of the culvert to carry off water caused by an "unprecedented flood," which may be defined as such an unusual and extraordinary rainfall as has no example or parallel in the history of rainfall in the vicinity affected, or as affords no reasonable warning or expectation that it will likely occur again.—Nashville, C. & St. L. v. Yarbrough (Ala.), 69 So. 582.

Proportional Rates

The Circuit Court of Appeals for the Fourth circuit holds that a joint proportional rate of 97 cents on coal from the Kanawha district in West Virginia to Toledo, the coal being for lake shipment beyond, does not apply to coal which though originally intended for lake shipment, was sold and delivered at Toledo as bunker coal. The shipper was bound to pay the lawful rate then in force on coal consigned to Toledo, $1.68, and the railroad had no option except to collect it. The reasonableness of that rate was a question for the commission, not for the courts. —Hocking Valley v. Lackawanna Coal & Lumber Co., C. C. A., 224 Fed. 930.

Preferential Rates—Unfavorable Locality—Switching Service—Terminal Facilities

The Louisiana Supreme Court holds that there is no rule of reason or of law which imposes on a railroad the burden of compensating, by preferential rates, the disadvantage resulting from unfavorable location under which either a community or a particular shipper may labor. An order of the Railroad Commission which throws on one railroad, out of several, the entire burden of putting an unfavorably situated place on a parity, as to freight rates, with a place that is favorably situated; which declares certain handling of freight cars between different stations, which is necessary to the delivery of the freight at its destination, to be "switch movements," and fixes a flat rate therefor, which is below the cost of the movement, the court holds to be unreasonable and properly annulled. Where freight is received for transportation, and delivered by the same carrier, or by a connecting carrier, who is a party to a through contract, the charge for transportation and delivery is largely regulated by the character of the commodity, and as some classes of goods are more valuable and some involve greater expense than others, the charge is determined accordingly, and includes the entire service. But there is no rational theory upon which

one of the carriers, in any such case, can be entitled to the highest rate and another be required to accept the lowest.

Switching service, as between railroad companies, is usually reciprocal, and it is inconceivable that when a particular company has hauled a carload of high class freight to the end of its road, it should have the right to require a connecting company to continue the haul and deliver the car at its ultimate destination as a switch movement, at a fixed price, without regard to the character of the contents of the car; and especially is that true where there is no possibility of its rendering a reciprocal service to such connecting carrier.

It is also held that it is unreasonable to suppose that a railroad company can afford to acquire extensive terminal facilities, build, maintain and operate a drawbridge, at an original cost of $276,662 and an annual expense exceeding $2,000, and charge no more for the use of such facilities, in the hauling, unloading and handling of cars, than for ordinary switching operations upon a track costing $11,000 a mile.—Vicksburg, S. & P. v. Railroad Commission, La., 69 So. 161.

Where Shipper Accompanies Cattle

Shippers agreed to load, transship and unload horses at their own risk, and during the transportation thereof to unload them whenever necessary, and one of the shippers accompanied them to take care of them. The New York Appellate Division holds that the carrier was not liable under the rest, food and water act for injuries caused by confinement for more than 36 hours, whether or not it had any sufficient excuse to offer to the federal authorities, especially where the shipper accompanying the horses never requested or desired that they be unloaded.

Where the car was equipped with ventilators and windows, it was the duty of the shipper accompanying the horses to open the ventilators, or cause the carrier to do so, and where he made no effort in that direction the carrier could not be held liable for injuries to the horses from lack of ventilation.—Haner v. Fargo, 151 N. Y. Supp., 913.

Extra Fares—Interference by Courts

New York law provides for the filing of tariffs, together with regulations determining the aggregate of rates in each particular case. Section 49 confers upon the commission a supervisory control, and whenever it deems tariffs or regulations unreasonable, it may determine the just and reasonable rates. An interurban electric railway filed a schedule providing for an extra charge to the passenger of 10 cents where he had not purchased a ticket. The plaintiff was ejected from defendant's car for refusal to pay the extra charge, and brought action on the ground that, the regulation being unreasonable, he was justified in refusing to pay. The New York Appellate Division holds that he had no standing to bring the action, the attack being on the rule itself, and not on the manner of its enforcement, and the reasonableness thereof being for the initial determination of the Public Service Commission, and not for the court.—Metzger v. New York State Rys., 154 N. Y. Supp. 789.

"Location" of Farm Crossing

An owner of land crossed by a railroad conveyed land to the company needed in making changes in the railroad, the deed providing that the company at some convenient place should construct an overhead crossing for the landowner, the location to be selected by the latter. The landowner designated a site, on which the company built a bridge at right angles to the track. The landowner claimed that the bridge was useless to him unless built diagonally across the track. There was evidence that it was the uniform method to construct such bridges at right angles to the road, so as to prevent obstructing the view of the enginemen and weakening the bridge, and that, if the bridge had been built diagonally, the approaches would have encroached on the land of another owner. The Kentucky Court of Appeals held that the bridge as constructed was a substantial compliance with the contract, as to "locate" a thing means to place it and not to design or construct it, and neither party could be allowed to arbitrarily exercise his right under the contract to the manifest injury or detriment of the other party.—Chesapeake & Ohio, Ky., 176 S. W. 22.

Railway Officers

Executive, Financial, Legal and Accounting

Z. G. Hopkins has been appointed special representative in charge of publicity for the Missouri, Kansas & Texas, with office at St. Louis, Mo., effective October 12.

Robert J. Mills, assistant to the president of the Streets Company, of Chicago, has resigned, and his duties have been taken over by W. L. Marston, vice-president and treasurer.

W. A. McDowell, secretary and general manager of the Lexington & Eastern, has been appointed general agent of the executive department of the Louisville & Nashville, with headquarters at Lexington, Ky.

Operating

W. McAuley, general yardmaster of the Winnipeg Joint Terminals, at Winnipeg, Man., has been appointed trainmaster, vice H. J. Hunt, promoted.

David J. Hagerty, trainmaster of the Northern Pacific at Missoula, Mont., has resigned to enter the traffic department of the Canadian Pacific at Saskatoon, Saskatchewan.

F. E. Harvey has been appointed assistant trainmaster of the Beech Creek sub-division of the New York Central Pennsylvania division, with headquarters at Jersey Shore, Pa., vice G. W. Bullock.

W. E. Bell has been appointed acting chief assistant to manager of telegraphs of the Grand Trunk and the Grand Trunk Pacific with headquarters at Montreal, Que., during absence on leave of A. P. Linnell.

J. C. Sesser, division superintendent of the Great Northern at Whitefish, Mont., has been transferred to Superior, Wis. J. J. Dowling, superintendent of safety, with headquarters at St. Paul, Minn., has been appointed to succeed Mr. Sesser.

H. C. Grout, general superintendent of the Atlantic division of the Canadian Pacific, at St. John, N. B., having been given leave of absence, A. C. Mackenzie, engineer maintenance of way, at Montreal, Que., has been appointed acting general superintendent, Atlantic division.

G. Collins, superintendent of the Canadian Northern at Trenton, Ont., has been appointed superintendent of branch lines, Toronto district, with jurisdiction over Picton, Maynooth, Tweed, Irondale and Kingston subdivisions with headquarters at Trenton, Ont., and P. H. Fox, chief despatcher at Trenton, Ont., has been appointed chief despatcher of the Toronto district with office at Rosedale, Toronto.

W. R. Kelly, assistant superintendent of the Canadian Northern at Trenton, Ont., has been appointed superintendent of the Lake Superior district, with office at Capreol, Ont., and the jurisdiction of this superintendency is extended over the Nipigon subdivision to Current. W. J. Curle, superintendent at Toronto, has been transferred to the Toronto district as assistant superintendent, with office at Toronto, and R. J. Kelly has been appointed trainmaster of the Lake Superior district, with office at Hornepayne, vice A. J. Gayfer, transferred.

C. M. Dukes, general chairman of the Brotherhood of Railway Trainmen, has been appointed assistant to the general manager of the Chicago, Milwaukee & St. Paul, with headquarters at Chicago, Ill. He was born at Marion, Iowa, on November 17, 1868, and following a common school education entered the service of the St. Paul as a freight brakeman, in 1890. He was promoted to yardmaster of the same road, at Cedar Rapids, Iowa, and later became a freight conductor. In 1902, he was elected general chairman of the Brotherhood of Railway Trainmen, with headquarters in Milwaukee, Wis. He remained in this position until his recent appointment on October 15.

J. F. Murphy, general superintendent of the Missouri Pacific-St. Louis, Iron Mountain & Southern with headquarters at St. Louis, Mo., has been appointed general manager to succeed J. W. Higgins, resigned, to become chairman of the General Managers' Association of Chicago. John Cannon, superintendent of

the Eastern division, with headquarters at Jefferson City, Mo., has been appointed general superintendent of the Eastern district, vice J. F. Murphy. W E. Brooks, superintendent of the Illinois division at Illmo, Mo., has been appointed superintendent of the Eastern division to succeed Mr. Cannon. H. H. Berry, trainmaster, has been promoted to the position vacated by Mr. Brooks. Effective November 1.

Traffic

Clarence E. Becker has been appointed district freight agent of the Canadian Pacific, with headquarters at Omaha, Neb.

J. D. Clardy has been appointed commercial agent of the Missouri, Oklahoma & Gulf, with headquarters at Ft. Worth, Tex., vice J. S. Smith, resigned.

H. G. Dowling has been appointed commercial agent of the Atlanta, Birmingham & Atlantic, with office at Waycross, Ga., vice O. M. Williams, resigned.

H. A. Johnson, general freight and passenger agent of the Colorado & Southern, with headquarters at Denver, Col., has been promoted to traffic manager.

P. D. Freer has been appointed division freight agent of the Cincinnati, Hamilton & Dayton and the Baltimore & Ohio Southwestern, at Chillicothe, Ohio, vice N. G. Spangler, resigned. H. E. Warburton has been appointed division freight agent of the Cincinnati, Hamilton & Dayton at Dayton, Ohio, vice P. D. Freer, promoted. Effective October 15.

Engineering and Rolling Stock

Victor R. Walling, first assistant engineer of the Chicago & Western Indiana, has been appointed principal assistant engineer, in charge of construction and maintenance, with office at Chicago. Mr. Walling graduated from Kansas University in 1901, receiving the degree of Bachelor of Science, and in 1911 received the honorary degree of C. E. from the same school. From June, 1901, to December, 1901, he was with the Greene Cananea Copper Company as draftsman and transitman; in 1902 he was with the Southern Pacific on preliminary surveys and location, leaving to return to the Greene Cananea Copper Company, with which he remained until June, 1912, when he entered the service of the Chicago & Western Indiana. While with the Greene Cananea Copper Company he held the positions of assistant engineer, first assistant engineer and superintendent in charge of railroad, mill and smelter construction and of superintendent in charge of maintenance and operation of the railroad. Since he has been with the Western Indiana he has had charge of the construction of clearing yard and shops, the track elevation on the Belt Railway between Belt Junction and the Pan Handle crossing along Seventy-fifth street and of the present track elevation work south of Seventy-first street on the Western Indiana main line, involving the elevation of over 40 miles of tracks.

V. R. Walling

J. Graham, assistant roadmaster of the Canadian Pacific, with headquarters at North Bend, B. C., has been appointed roadmaster, with office at Nelson, B. C.

C. R. Hening, roundhouse foreman of the Michigan Central at Kensington, Ill., has been appointed general foreman of the machine shop at Michigan City, Ind.

H. P. Thomas has been appointed supervisor of Division No. 20 of the Pennsylvania Railroad, with office at Hollidaysburg, Pa., vice W. E. Brown, promoted.

W. E. Guignon, division engineer of the Pennsylvania Lines West at Zanesville, Ohio, has been transferred to Logansport, Ind., vice A. C. Watson, transferred to Cleveland, Ohio.

C. T. Delamere, acting engineer of construction of the Canadian Pacific, at Montreal, Que., has been appointed acting engineer maintenance of way, Eastern Lines, vice A. C. Mackenzie appointed acting general superintendent, Atlantic division.

E. Eley, division car foreman of the Canadian Pacific at North Bay, Ont., has been appointed master car builder, eastern lines, with office at Montreal, Que., vice F. B. Zercher, and Gordon Sproule has been appointed acting engineer of tests, with office at Montreal, vice E. B. Tilt, resigned.

W. C. Moore, master mechanic of the Ottawa division of the Canadian Northern at Trenton, Ont., has been appointed master mechanic of the Toronto district, with headquarters at Trenton, Ont. J. H. McAlpine, locomotive foreman at Winnipeg, Man., has been appointed master mechanic, Lake Superior district, with office at Parry Sound, Ont.

Samuel G. Thomson, superintendent of motive power and rolling equipment of the Philadelphia & Reading at Reading Pa., having resigned, Irwin A. Seiders, fuel inspector at Reading, has been appointed superintendent of motive power and rolling equipment, and Clyde C. Elmes, assistant engineer of motive power, at Reading, has been appointed assistant superintendent of motive power and rolling equipment.

Curtis C. Westfall, whose appointment as engineer of bridges of the Illinois Central has been announced, was born on July 14, 1886, at Bushnell, Ill. He graduated from the University of Illinois in 1907, and in June of the same year entered the employ of the Illinois Central. He remained with this road in the capacities of draftsman and assistant engineer in both the bridge and construction departments until August, 1911. From August, 1911, to January, 1913, he was assistant engineer in connection with the Grand Crossing track elevation work in Chicago, Ill. From January, 1913, to October, 1913, he was chief engineer in charge of the construction of 70 miles of railroad in North Dakota. From November, 1913, to October, 1915, he was assistant engineer in the bridge department of the Illinois Central.

G. P. MacLaren has been appointed division engineer of the Toronto district of the Canadian Northern, with office at Rosedale, Toronto, Ont.; A. J. Gayfer has been appointed division engineer of the Lake Superior district with office at Capreol, Ont.; J. D. Evans, division engineer at Trenton, Ont., has been appointed supervisor of bridges and buildings, with office at Trenton; F. McKay, supervisor of bridges and buildings at Toronto, has been appointed supervisor of bridges and buildings, with office at Capreol, Ont.; E. Myers, roadmaster at Trenton, Ont., has been appointed supervisor of track, with office at Rosedale, Toronto, Ont.; W. M. Jacklin, inspector of tracklaying on construction at Port Arthur, Ont., has been appointed supervisor of roadway, with office at Hornepayne, Ont.; J. MacDonald, supervisor of track, Central Ontario and Quinte districts, at Trenton, Ont., has been appointed supervisor of track with jurisdiction over Maynooth, Picton, Irondale and Tweed subdivisions, Toronto district, with office at Trenton; J. R. Audet has been appointed supervisor of roadway, Capreol to Oba, Lake Superior district, with office at Capreol, Ont., and E. Haystead, supervisor of track at Parry Sound, Ont., has been appointed supervisor of track, with office at Capreol.

OBITUARY

William Byrd King, vice-president and general manager of the Ft. Worth Belt until his resignation on account of ill health about a year ago, died in Ft. Worth, Tex., on October 11. He was born in Orange county, Va., on December 29, 1850, and entered railway service in 1869. Among the noteworthy positions he held were chief engineer of the Ft. Worth & Denver City, from 1889 to 1891; chief engineer, vice-president and general manager of the Ft. Worth & Rio Grande, from 1891 to 1902; general manager of the stock yards at Ft. Worth, and his last office, with the Ft. Worth Belt, mentioned above.

John W. Logsdon, formerly superintendent of the Louisville & Nashville, died on October 8, at Pensacola, Fla., at the age of 59. Mr. Logsdon's entire railway service had been with the Louisville & Nashville. He began railway work in 1876 as agent's sistant agent, operator, agent, master of trains, general agent, clerk on that road, and subsequently served consecutively as assuperintendent of the Owensboro & Nashville division, assistant superintendent main stem (Second division) and Nashville & Decatur and Nashville, Florence & Sheffield divisions. From March, 1892, to August, 1900, he was superintendent of the Cumberland Valley division, and then was superintendent of the St. Louis and Henderson divisions, at Evansville, Ind., until December, 1914, when he retired from active duty on account of ill health.

James H. Foulds, Jr., formerly from February, 1910, to January, 1914, auditor of disbursements of the New York Central & Hudson River, died on October 4, at his home in White Plains, N. Y., after a long illness. Mr. Foulds was born at Salmon Falls, N. H., on September 26, 1862, and began railway work in the accounting department of the Boston & Albany at Springfield, Mass., in June, 1882. He was transferred to Boston in September, 1889, when the accounting department was moved to that city, and served as a clerk in the auditor's office until February, 1902, when he was transferred to the auditor's office of the New York Central & Hudson River, at New York city. In January, 1906, he was appointed chief clerk of the auditor's office, and on February 1, 1910, was appointed auditor of disbursements, from which position he retired on January 1, 1914, on account of ill health.

J. H. Foulds, Jr.

Robert H. Hill, formerly from January, 1895, to May, 1906, auditor of the Lake Shore & Michigan Southern, died on October 14, at West New Brighton, Staten Island, N. Y. He was born on February 25, 1832, at London, England, and began railway work in 1858, as a clerk on the Michigan Southern & Northern Indiana, subsequently merged in the Lake Shore & Michigan Southern. From 1863 to 1864 he was freight agent of the same road at West Detroit, Mich., and then for one year was freight agent at Detroit. He subsequently served for one year as contracting agent at Chicago, and from 1866 to 1869 was chief clerk in the freight department of the same road. In 1869 he was appointed chief clerk of freight accounts of the Lake Shore & Michigan Southern, remaining in that position until 1890, when he was appointed auditor of freight receipts. From June, 1894, to the following January he was acting auditor and then was appointed auditor of the same road, from which position he retired in May, 1906, after a service of 48 years on the Lake Shore & Michigan Southern, now a part of the New York Central.

R. H. Hill

Equipment and Supplies

LOCOMOTIVE BUILDING

The St. Paul Union Depot is reported to have ordered 2 switching locomotives.

The Interstate Railroad has ordered 2 locomotives from the Baldwin Locomotive Works.

The Baltimore & Ohio has ordered one Mallet type locomotive from the Baldwin Locomotive Works.

The Raritan River has ordered one Consolidation type locomotive from the Baldwin Locomotive Works.

The Cement, Tolenas & Tidewater is in the market for 1 Mikado type locomotive with 20½ by 28 in. cylinders.

The Arthur Iron Mining Company, F. A. Bushnell, purchasing agent, St. Paul, Minn., is in the market for 8 locomotives.

The Central of Georgia has ordered 8 Mikado type locomotives and 4 Pacific type locomotives from the Lima Locomotive Corporation.

The Michigan Central has ordered 7 Pacific type locomotives from the American Locomotive Company and is inquiring for 6 Mikado type locomotives.

The Illinois Central has ordered 47 Mikado type locomotives from the Lima Locomotive Corporation and 3 Santa Fe type locomotives from the American Locomotive Company.

The Lehigh Valley has ordered 10 Mikado type locomotives from the Baldwin Locomotive Works and has given the latter an order to repair 20 other engines and equip them with superheaters.

The New Orleans & North Eastern has ordered 4 Mikado type locomotives from the Baldwin Locomotive Works to be used on the Vicksburg, Shreveport & Pacific. These locomotives will have 22 by 28 in. cylinders.

The Chicago Junction, reported in the *Railway Age Gazette* of October 8 as having ordered 2 superheater six-wheel switching locomotives from the American Locomotive Company, has increased this order to 3 locomotives.

The Cincinnati, Indianapolis & Western, which was reported in the *Railway Age Gazette* of October 1 as inquiring for prices on 48 locomotives, has issued inquiries for 8 Mikado, 6 Pacific, 15 ten-wheel, 10 Consolidation and 7 six-wheel switching locomotives. This company was at one time a part of the Cincinnati, Hamilton & Dayton and owned that part of its system west of Hamilton, Ohio, including a line from that point to Springfield, Ill., with a branch from Sidell, Ill., to West Liberty, crossing the main line at Hume, and aggregating approximately 361 miles of line. In the latter part of September, 1915, it was bought at a foreclosure sale by the bondholders and has since been operated by them independently of the Cincinnati, Hamilton & Dayton and, hence, of the Baltimore & Ohio. B. A. Worthington is vice-president and general manager and John Simmons, general superintendent, both with offices at Indianapolis, Ind. See also item in Financial News under date of September 17, page 548.

CAR BUILDING

The Baltimore & Ohio is inquiring for 500 box car bodies and is also said to be in the market for 1,000 hopper cars.

The Norfolk & Western is in the market for 1,000 90-ton gondola cars.

Phelps, Dodge & Co. have ordered 50 ore cars from the Pressed Steel Car Company.

Cincinnati, Indianapolis & Western.—See item above under Locomotive Building.

The Nashville, Chattanooga & St. Louis is in the market for 1,000 center constructions.

The Minneapolis & St. Louis is formally inquiring for 500 40-ton steel underframe box cars.

The Missouri, Kansas & Texas has ordered 200 ballast cars from the Roger Ballast Car Company.

The Central of New Jersey is inquiring for 1,000 steel hopper cars, 1,000 box cars and 250 ice cars.

The Illinois Central has ordered 1,000 refrigerator cars from the American Car & Foundry Company.

The Michigan Alkali Company, Wyandotte, Mich., has ordered 50 50-ton hopper cars from the Pressed Steel Car Company.

The Central of Georgia has ordered 500 freight cars from the American Car & Foundry Company, and 500 box cars from the Pullman Company.

The Boston & Maine has ordered 6 70-ft. steel coaches and 2 70-ft. steel smoking cars from the Pullman Company and 6 baggage cars from the Laconia Car Company.

The Philadelphia & Reading has ordered 1,000 box cars from the American Car & Foundry Company; 500 gondola cars from the Standard Steel Car Company, and 1,000 hopper cars from the Pressed Steel Car Company.

The Western Maryland, which has been inquiring for 1,000 70-ton steel hopper cars, recently changed its specifications to include the same number of 50-ton hopper cars. It is now further reported to have ordered 2,000 hopper cars from the Pullman Company, but the latter item has not been confirmed.

IRON AND STEEL

The Missouri Pacific has ordered 15,000 tons of rails from the Illinois Steel Company.

The Illinois Central has ordered 15,000 tons of rails from the Illinois Steel Company.

The Pere Marquette has ordered 17,000 tons of rails from the Algoma Steel Corporation.

The Southern has ordered 2,300 tons of bridge material from the American Bridge Company.

The Long Island has ordered 3,500 tons of fabricating materials from the American Bridge Company.

The New York Central is inquiring for 500 tons of steel for a bridge over the Erie barge canal near Rochester, N. Y.

The Central of New Jersey is reported to have ordered 1,500 tons of steel from the American Bridge Company.

The Wabash has ordered 7,500 tons of rails from the Lackawanna Steel Company and the United States Steel Corporation.

The Great Northern has ordered 15,000 tons of rails from the Illinois Steel Company and 5,000 tons from the Lackawanna Steel Company.

The Baltimore & Ohio Chicago Terminal has ordered 252 tons of steel from the American Bridge Company for a freight house to be built at Twelfth street, Chicago.

MACHINERY AND TOOLS

The Arthur Iron Mining Company is in the market for 6 steam shovels and 1 locomotive crane.

Amur Railway, in Siberia, Approaching Completion.—The number of railways serving Russia's Pacific ports is increasing. In six months the through traffic on the new Amur Railway will be opened. The most important work still to be done is on the bridges at two points. When the traffic opens from Kuenga, where the line joins the Transbaikal Railway, there will be a double-track line through all Siberia from the Pacific ports, Vladivostok and Nikolaieffsk. The difficulties overcome in the construction of the Amur Railway resemble those of the Transcaucasian Railway 20 years ago.—*Railway Gazette, London.*

Supply Trade News

The Hilles & Jones Company, Wilmington, Del., has moved its Pittsburgh office to larger quarters in the Oliver building, Room 235.

At the annual meeting of the American Locomotive Company, held in New York on October 19, Vice-President Leigh Best was elected a director to succeed William M. Barnum.

The American Steel Foundries is reported to have closed a contract with the British government for $20,000,000 worth of war materials, including principally castings for shell work.

Stanley H. Smith has been appointed district sales manager of the Pennsylvania Steel Company and the Maryland Steel Company at Chicago, Ill., to succeed Robert E. Belknap, transferred to New York city.

Robert Allan, representative of the Burd High Compression Ring Company, Rockford, Ill., has been appointed district branch manager for northern California, with offices at 847 Phelan Building, San Francisco, Cal.

The George E. Molleson Company, sales agents for iron and steel products and railway supplies and New York representatives for the Tyler Tube & Pipe Company, Washington, Pa., has moved its offices from 50 Church street to 30 Church street, New York.

Arthur C. Everham, formerly assistant chief engineer of the Kansas City Terminal, is now engineer of construction for the Kansas City Bridge Company. He will have charge of all construction work of the company and will give particular attention to government and railroad construction.

The Chambers Valve Company, New York, announces that it has received orders for Chambers throttle valves to be installed on 45 locomotives for the Chicago & North Western; 33 for the Erie; 13 for the Texas & Pacific; 30 for the Norfolk & Western, and 2 for the Mobile & Ohio.

W. Hoyt Weber & Co., New York, have completed arrangements with the MacDonald Car Buffer, Limited, of Montreal and Pittsburgh, whereby they will represent the latter in the eastern part of the United States. The members of the firm are W. Hoyt Weber and Horatio S. Schroeder. The firm has offices in the Vanderbilt Concourse building.

The committee on arts and sciences of the Franklin Institute at Philadelphia has announced that it will recommend the award of the John Scott Legacy Medal and Premium to Clement F. Street, vice-president of the Locomotive Stoker Company, New York, for the Street locomotive stoker. This appliance has now been installed on over 700 locomotives, more Street stokers being in use than those of any other make.

The International Oxygen Company is erecting an oxygen and hydrogen generating plant at Verona, Pa., in charge of Phillip J. Kroll as branch manager, for the accommodation of its customers in the Pittsburgh district. The new factory will enable the company to make better deliveries in this district than were possible from its plant at Newark, N. J., and it will serve as a demonstrating installation of the I. O. C. system for inspection by officers of other companies who are considering installing generating apparatus in their own plants.

The Canadian Car & Foundry Company has sold to the Royal Securities Company of Montreal $250,000 preferred stock, $250,000 common stock and $1,000,000 6 per cent debenture notes of the Canadian Steel Foundries, which it controls. The money received from the sale of the securities is to be used in financing the large war orders taken by the company. By the sale of the $250,000 preferred stock the amount of this stock now outstanding is increased to $7,250,000 out of a total authorized issue of $7,500,000. The common stock outstanding is increased by the sale to $4,225,000 out of $5,000,000 authorized. War orders placed with the Canadian Car & Foundry Company by the Russian Government amount to $142,000,000, including only business actually signed for.

Owing to the increase in the demand for the Thomas rail anchor tie plate and other track specialties made by the Chicago Malleable Castings Company, West Pullman, Chicago, that company has established a "Thomas specialty department," which will be in charge of J. W. Thomas, W. H. Kofmehl and Fred F. Bennett. Mr. Thomas, the inventor of these specialties, has had 30 years' practical experience with track work on the St. Paul, the Rock Island, the Burlington, the Missouri Pacific, the Santa Fe, the Ft. Worth & Denver City and other railroads. Mr. Kofmehl has been for 25 years roadmaster on the Chicago, Milwaukee & St. Paul. Mr. Bennett has been identified with the railway supply field for many years. At one time he was representative of the *Railroad Gazette* (now the *Railway Age Gagette*) west of Buffalo and Pittsburgh, and later sales agent of the American Steel Castings Company (now the American Steel Foundries).

Negotiations have practically been completed whereby the Pennsylvania Company will transfer to the Bethlehem Steel Corporation its controlling interest in the Pennsylvania Steel Company, all that is now needed being the assent of the Reading interests. On January 1, 1915, the Pennsylvania Steel Company's outstanding stock consisted of $20,560,800 preferred and $10,750,000 common, of which the Pennsylvania Company owned $9,158,300 preferred and $7,388,900 common, and the Pennsylvania Railroad $584,700 preferred. The Reading Iron Company (a subsidiary of the Reading Coal & Iron Company) at present owns approximately $4,000,000 preferred and $3,000,000 common. Payment for the stock to be acquired by the Bethlehem Steel Corporation will be provided for through cash and bonds bearing 5 per cent interest. The preferred stock will be exchanged for bonds at par, and the common stock at about $35 a share. The Pennsylvania Company, which, as noted above, now owns a majority of the Steel Company stock, will acquire the minority interest and the total amount of stock acquired will be turned over to the Bethlehem Company, which will retain the securities as a holding company. Dividends of 7 per cent were paid on the preferred stock of the Pennsylvania Steel Company from November 1, 1901, to November, 1912; no dividends have been paid on the common. The acquisition of the company by the Bethlehem interests will strengthen the latter greatly, more particularly as the Pennsylvania Steel Company controls the Maryland Steel Company, operating a large ship building plant and rail mill at Sparrows Point, Md., and the Spanish-American Iron Company, owning large ore deposits in Cuba. The Pennsylvania Steel Company is said to own the largest deposits of iron ore of any of the independent companies, and much of this is of very high grade.

Westinghouse Air Brake Company

This company's net earnings in the fiscal year ended July 31, 1915, were considerably below those of the preceding year, but as the company is now working on a large order for munitions, it was possible to continue the dividends at the usual rate. The net sales of the Wilmerding plant were approximately one-third less than those of 1914, and only 62 per cent of the average net sales for the past five fiscal years. The net profit for the year was $1,575,839. This compares with $3,482,994 in 1914, or $5,255,259 (after deducting depreciation of $809,519) in 1913. Charges for depreciation on buildings and machinery in 1915 totaled $207,768.

During the year the electrical and brake business formerly carried on in France by the Societe Anonyme Westinghouse was divided and the brake business was taken over by a new company, the Compagnie des Freins Westinghouse, the ownership of which is vested in the Westinghouse Air Brake Company and the Westinghouse Brake Company, Limited, of London. This ownership was acquired by transferring to the British Westinghouse Electric & Manufacturing Company, Limited, holdings in the Societe Anonyme Westinghouse, in which the American company is no longer interested.

The report says that the subsidiary companies in England, Italy and Russia are doing well despite the war, although the English company has thought it best to reduce its annual dividend from 20 to 10 per cent.

The outlook for the company is good. The unfilled orders on August 1, 1915, were $800,000 greater than on August 1, 1914. This total, however, did not include the order for munitions spoken of in the report as follows:

"During the month of April, 1915, your company accepted orders for 18-lb. shrapnel, complete, except propellant power, and additional cartridge cases amounting in total to $17,930,000. While the terms are favorable, with ample guarantees against contingencies, these orders have necessitated a heavy expenditure for special machinery, and for its installation in temporary, though substantial, buildings, to the end that the maximum output of the company's regular product might not be affected in case of a sudden revival of the railway supply business. It is expected that when the value of this special machinery and the buildings not available for future use shall have been charged off, the net result will represent a substantial but not an unusual manufacturing profit on the amount involved.

"The factor that chiefly influenced the management in deciding to undertake this special line of work was the unfavorable outlook for the railway supply business in general and the desire to prevent, if possible, a repetition of the hardships endured by your working force last winter through lack of employment. There is, however, another consideration which should be mentioned, namely, the conviction arising from a study of the unexampled conflict now raging in Europe that the time has come for some of our larger manufacturing concerns to prepare themselves, by the installation of equipment and especially by the acquisition of technical and mechanical experience now so woefully lacking, to assist the United States government in the defense of our own country, should such a contingency arise."

There follows the general consolidated balance sheet for July 31, 1915. There has been a decrease of $250,000 in contingent surplus representing the excess of par value of the stock of subsidiary companies over the amount at which they are carried on the books of the parent company. An increase of $1,203,804 in inventory results from the large accumulation of material on hand for special contracts. The surplus shown of $4,390,342, compares with $5,648,865 on August 1, 1914, the dividends paid having slightly exceeded the net returns.

ASSETS

Cash	$2,067,761	
Accounts and bills receivable, considered good	2,551,607	
Inventory	6,729,346	
Deferred charges to operation	51,339	
Investments	8,294,904	
Factories	6,572,036	
Real estate, other than for factories	1,892,000	
Patents and goodwill	2,790,515	
		$30,949,509

LIABILITIES.

Accounts payable	$692,495	
Advances on contracts	2,073,050	
Accrued liabilities	141,180	
Contingent liability on account of sales, subject to future settlements	163,810	
		$3,070,535
Capital stock	19,638,467	
Accumulated funds:		
(1) Reserve for extraordinary repairs and replacements, inventory adjustments and extraordinary losses	$1,850,165	
(2) Reserve to provide for expenditures account of developments, etc.	500,000	
(3) Contingent surplus, excess par value capital stock of subsidiary companies over value on books of Westinghouse Air Brake Company	1,500,000	
(4) Surplus, applicable to dividends	4,390,342	
	$8,240,507	
		$30,949,509

TRADE PUBLICATIONS

INSPECTION OF CREOSOTED TIMBER.—Robert W. Hunt & Co., engineers, Chicago, have issued a booklet describing the inspection of creosoted timber and including specifications for paving with creosote wood blocks, adopted by the Association for Standardizing Paving Specifications.

HIGHWAY BRIDGES.—Robert W. Hunt & Co., engineers Chicago, have prepared a booklet on the inspection and testing of materials for highway bridges, containing specifications for structural steel for bridges, billet-steel and rail-steel reinforcement bars, and for steel castings, adopted by the American Society for Testing Materials.

WATER SOFTENING.—The L. M. Booth Company, New York, has recently issued a bulletin relative to the company's type F water softeners. The booklet is attractively illustrated. It explains the operation of the softeners in detail, showing sectional views of the softeners at work. There are also given a number of views of typical installations.

Railway Construction

Atlantic Coast Line.—Announcement has been made by this company, it is said, that an extension is to be built from the present southern terminus of the line now in operation to Sebring, Fla. The proposed route is southeast from Sebring to a point on the shore of Lake Okeechobee, about 60 miles.

Canadian Pacific.—Construction work is to be pushed on an additional 25 miles of track from Foremost, Alta., east to a point about 10 miles from Lake Pakowki. This will form part of the through line between Weyburn, Sask., and Lethbridge, Alta., and when this section is finished there will only be a gap of about 44 miles between the line now terminating at Altawan, Sask., and the east end of the Foremost extension.

Hiawasse Valley.—Grading work will be finished in about 30 days on the line building from Andrews, N. C., southwest via Peachtree to Hayesville, 25 miles. The maximum grades will be 2.5 per cent, and the maximum curvature 16 deg., and there will be two steel bridges on the line. The company expects to develop a traffic in lumber and forest products. The Wright-Johnston Company, Andrews, N. C., are the contractors. F. A. Cloud, chief engineer, Andrews. (May 7, p. 993.)

Illinois Central.—The report of this company for the year ended June 30, 1915, shows that during the year new rail was laid on 262.23 miles of track; 99 new industrial tracks were built or extended, making a net addition of 7.46 miles; 401 new company sidings were built or extended, making a net addition for the year of 69.64 miles and second main track between Fulton, Ky., and Memphis, Tenn., under construction last year has been completed. A cut-off was built from Fredonia, Ill., on the Carbondale district to Reeds Junction on the Johnston City branch, 1.77 miles. This involves the abandonment as first main track of 6.64 miles of line between Fredonia and Carbondale Junction. The second main track at Parkway, Ill., was extended to Broadview, 2.46 miles, and additional side track was constructed, for handling passenger traffic to and from Speedway, Ill. At Paducah, Ky., the freight yard was added to by the construction of 6.28 miles of siding, and the freight yard at Fulton, Ky., was increased by 6.59 miles. The reduction of grades between Paducah and Princeton, and the enlargement of yard facilities at the latter point were continued and were about finished at the close of the year. The elevation of the tracks at Memphis, Tenn., also the construction of the new passenger facilities at that place, were also completed, and the raising of tracks and relocating of main line in connection with levee improvements, being made by the city authorities at North Memphis, were undertaken during the year and are about half finished. Grade crossing elimination work at Grand Crossing, Chicago, Ill., track elevation work between Seventy-ninth street and One Hundred and Sixteenth street, Chicago, and through Cicero, also grade revision at Mattoon, were still in progress at the close of the year. Work of strengthening the Cairo bridge to carry heavier rolling stock was completed during the year. To facilitate the handling of coal traffic a double track connection was installed between the junction of the Carbondale and Johnston City districts near Cambria, Ill., for 1.34 miles. A viaduct was completed over Nicholas street, Omaha, Neb., and an overhead bridge constructed at Monticello, Wis. Work was started and is still under way on subways at Prairie avenue, Decatur, Ill., and Phinney Park boulevard, Fort Dodge, Iowa.

Kettle Valley Lines.—It is expected that work will be completed by December on the extension from Coquihalla summit to Hope, B. C., on the Fraser river. Track laying is now under way from the Hope end and has been completed, it is said, to Ladner creek, where a steel bridge is being built. (April 16, p. 871.)

Newton, Kansas & Nebraska.—This company has awarded a contract for a railway from Newton, Kan., through Harvey, McPherson, Dickinson, Saline, Clay and Washington counties, to the Newton Construction Company. S. O. Waddell, Newton, Kan., chief engineer.

New York Subways.—The New York Public Service Commission, First district, has submitted the proposed form of contract for the construction of Section No. 2, of Routes Nos. 19 and 22, being a part of the Southern boulevard and Westchester avenue branch of the Lexington avenue subway, to the Interborough Rapid Transit Company. This company is made a party to the contract, and will bear part of the construction cost. The underground portion of this line ends at Bancroft street, in the borough of the Bronx, and Section No. 2, which will be elevated, extends northerly from that point along Westchester avenue to Eastern boulevard, or Pelham Bay Park. The commission has completed negotiations with the government for the construction of the necessary fixed bridge across the Bronx river, the last obstacle to the construction of the line.

Oregon, California & Eastern.—This company has been incorporated to build a railway from Bend, Crook county, Oregon, to Lakeview, Lake county, with branch lines running from Silver Lake, Lake county, to Kirk, Klamath county, from Millican, Crook county, to Arden, Harney county, and from a point to be determined to Warner Valley, Lake county. The capitalization is $100,000; the officers are P. B. Ellis, president, L. S. Ellis, vice-president, and William Muller, secretary and treasurer. The Oregon office will be at Portland.

Patterson & Western.—This company has been incorporated to build a railway in Santa Clara and Stanislaus counties, Cal. R. J. Pratt, 3388 Clay St., San Francisco, Cal.

Pennsylvania Roads (Electric).—According to press reports the project to build a line from Milford, Pa., Pike county, northeast to Port Jervis, about eight miles, is being revived. Residents of Milford have guaranteed an amount of $25,000, it is said, in aid of the project to build an electric line between these two places. Gifford Pinchot, Milford, may be addressed.

Roach Timber Company.—This company will do some additional grading on its rail line from Sutherlin, Ore., to its timber holdings, in the near future. W. L. Roach, president, Muscatine, Iowa.

San Antonio & Austin Interurban.—This company has revived its plans for building an interurban electric line between San Antonio, Tex., and Austin, about 80 miles, and negotiations for financing the project are now in progress. The proposed line will pass through the towns of New Braunfels, Hunter, San Marcos, Kyle, Buda and Manchaca. A survey for the route was made some time ago and much of the right of way has been secured.

Seaboard Air Line.—On the section between Sanford, N. C., and Apex, 28 miles, this company is making some corrections and revisions in its grade lines, removing therefrom certain quick changes of gradients and improving the objectionable dips. This is a part of the general scheme of revision in that territory. There will be no change of alinement. Ballasting and the laying of new rail will follow as soon as the grade changes are accomplished.

Southern Railway.—The report of this company for the year ended June 30, 1915, shows that the double track construction work on the main line north of Charlotte, N. C., including improved alinement and elimination of heavy grades, has been pushed on 100 miles of the 142 between Washington and Charlotte, which was operated as single track at the beginning of the past fiscal year. Of this mileage, 27 miles between Pelham, N. C., and Brown Summit, were in operation as double track at the close of the year, and it is expected that the remaining 73 miles on which work is now under way will be completed before April, 1916. At the close of the year there was 434.03 miles of double track in operation. Since the close of the fiscal year money has been made available for double track work and other improvements. The work in immediate contemplation consists of 56 miles between Spartanburg, S. C., and Central, and the 23 miles between New Holland, Ga., and Cornelia. On the section of 100 miles of main line on which double track work has been under construction, 54 out of 73 grade crossings were eliminated. In addition to the terminal yards at Richmond, Va., at Spencer, N. C., and Winston-Salem, at Mobile, at Finlay, Ala., and at Forrest, Tenn., work was carried out on a new yard at Denverside, near East St. Louis, Ill., also on new facilities for both passenger and freight traffic at Spartansburg, S. C., and the separation of busy grade crossings in several cities. Since the close of the year the export coal terminal at Charles-

ton, S. C., has been put into operation. Arrangements have been made to provide a union passenger station at Macon, Ga., and new passing, side and spur tracks comprising 89.27 miles were constructed.

Texas Roads (Electric).—The preliminary survey for a proposed interurban electric line to be built between Temple, Tex., and Marlin, about 40 miles, has just been made by S. D. Hanna, and the organization of a company to build the line is now in progress. Residents of Temple and Marlin are financing the project, it is said, and plans for building the line are well advanced. It is expected that the construction work will be started this year.

Torrington & Thomaston Traction.—An officer of this company which was recently organized writes that the prospects of building the proposed electric line from Torrington, Conn., south to Thomaston, 10 miles, are good, and that the cost will be about $200,000. Work on the line, which calls for the construction of two short steel bridges, will be carried out next year. H. Mann, president; H. M. Guernsey, vice-president; G. B. Goodwin, treasurer, and E. T. Canfield, secretary. (October 8, page 670.)

RAILWAY STRUCTURES

Bear Creek, Minn.—The Chicago Great Western has ordered 55 tons of steel from the Chicago Bridge & Iron Works to be used in reinforcing a viaduct. Twenty truss spans and 38 tower posts will be strengthened. The steel was shipped early this week.

Chicago, Ill.—The engineering department of the Illinois Central is again preparing plans and specifications for a bridge on the St. Charles Air Line over the Chicago river.

Evansville, Ind.—The contract for the new Illinois Central freight house and the extension of the old structure has been let to George P. Swift & Co., of Chicago.

Huntingdon, Pa.—The state water supply commission of Pennsylvania has approved the plans submitted by the Pennsylvania Railroad to build a bridge over Dotter run, also a bridge over Mill Creek in Rockland township, Venango county; and a bridge over Catfish run in Madison township, Clarion county.

Lynchburg, Va.—A reinforced concrete bridge is to be built over the James river, and the tracks of the Norfolk & Western, the Chesapeake & Ohio and the Southern Railway. It is proposed to build a structure with 19 arch and arched girder spans, to cost $250,000. The cost of the work is to be paid for jointly by the above railroads and the city of Lynchburg. Bids have not yet been asked for this improvement.

Miami, Fla.—An officer of the Florida East Coast writes, regarding the report that new car shops are to be built at Miami, that the company does not contemplate that any work will be done on this improvement in the immediate future.

New London, Conn.—The New York, New Haven & Hartford will built a bridge over the Thames river between Groton and New London. The proposed structure is to have a concrete substructure with steel superstructure of three 330-ft. riveted truss spans, one 185-ft. fixed span and one 185-ft. bascule span. The total estimated cost of the bridge is $2,000,000. Contracts for the work have not yet been let.

Nonconnah, Tenn.—The Federal Cement Tile Company, of Chicago, has the contract for the roofing for the Illinois Central repair shop. (October 8, p. 671.)

North Toronto, Ont.—Work is now under way on a new station at Yonge street to be used jointly by the Canadian Pacific and the Canadian Northern. The new station forms part of improvements being carried out to include the elevation of the railway tracks and the elimination of all grade crossings on about three miles.

Olympia, Wash.—The E. D. Rounds Construction Company of Seattle, Wash., has been awarded a contract for erecting a depot for the Oregon-Washington Railroad & Navigation Company. The cost is estimated at $25,000.

Winston-Salem, N. C.—An officer of the Norfolk & Western writes, regarding the report that a new steel viaduct is to be built at Winston-Salem, that plans for the viaduct will not be completed for several months.

Railway Financial News

Chicago, Milwaukee & Gary.—The securities which were pledged as collateral for notes aggregating $1,813,036 were bid in by a representative of the noteholders at a price equalling the par value and interest of the notes. The collateral consists of bonds with a face value of $5,764,000 and stock with a par value of $5,475,000.

Chicago, Rock Island & Pacific.—The seven directors agreed upon by various Chicago, Rock Island & Pacific interests were elected at a stockholders' meeting held on October 14. The new directors are: Edmund D. Hulbert, vice-president of the Merchants Loan & Trust Company, Chicago; Charles D. Dawes, president of the Central Trust Company of Illinois, Chicago; John G. Shedd, president of Marshall Field & Co., Chicago; Nathaniel French, Davenport, Iowa; William B. Thompson, director of the Federal Reserve Bank of New York; John R. Morron, president of the Atlas Portland Cement Company, New York, and Joel W. Burdick, Pittsburgh.

Ft. Smith & Western.—This road, running from Ft. Smith, Ark., to Guthrie, Okla., 217 miles, has been placed in the hands of a receiver by the United States District Court on the application of the trustee of its outstanding $6,240,000 bonds.

Greenville Northwestern.—Application has been made for a receiver in the suit brought to foreclose a deed of trust for $63,300.

Missouri, Kansas & Texas.—A protective committee has been formed to represent the preferred and common stockholders. The committee consists of Alvin W. Krech, chairman; Frank H. Davis, Charles Hayden, J. J. Slocum, S. A. Mitchell and A. W. Smithers. The Stockholders have been asked to deposit their stock with the Equitable Trust Company, New York.

Missouri Pacific.—The reorganization committee which is acting with Kuhn, Loeb & Co., New York, has extended the time for deposits of stocks and bonds under the previously announced reorganization plan to December 15.

New Jersey & Pennsylvania.—This road was sold under foreclosure on October 18, following the refusal of Vice-Chancellor Howell, of New Jersey, to confirm a previous sale. The completed portion of the road was bid in by a representative of the bondholders for $27,000 and the uncompleted portion by G. F. Fisher, of New York, for $1,600. The sale is subject to confirmation.

New Orleans, Mobile & Chicago.—The federal court at Mobile, Ala., has confirmed the sale of that property to a committee representing the bondholders.

Seaboard Air Line.—A special stockholders' meeting has been called for November 15 to vote on the question of approving the merger of the Seaboard Air Line and the Carolina, Atlantic & Western (mentioned in these columns last week) and to authorize an issue of $300,000,000 bonds. Upon the approval of the issue of $25,644,000 of these bonds of which $2,750,000 are to be held in the treasury of the consolidated company, approximately $5,725,000 are to be used to retire an equal face amount or underlying first mortgage 6 per cent bonds of the Carolina, Atlantic & Western and $17,168,500 have been sold to a syndicate headed by the Guaranty Trust Co., and the National City Bank.

The new company formed by the consolidation will be known as the Seaboard Air Line Railway Company, and will assume all the obligations of the consolidated companies, including the $300,000,000 first and consolidated gold bonds. It is not proposed at this time that the new mortgage shall be a lien on any of the existing Air Line mileage, but there will be pledged under it approximately $22,162,000 Seaboard refunding bonds now in the company's treasury or pledged to secure its notes.

The provisions for the issuance of stock of the new company were mentioned in these columns last week.

[ADVERTISEMENT.]

ANNUAL REPORTS

SOUTHERN RAILWAY COMPANY—TWENTY-FIRST ANNUAL REPORT

RICHMOND, VA., October 12, 1915.

To the Stockholders of Southern Railway Company:

The Board of Directors submits the following report of the affairs of the Company for the year ended June 30, 1915:

It has been a difficult year. After a period of unexampled prosperity throughout the South, attended by growth and expansion in all forms of industry, business had begun to slow up during the early months of 1914. Although for this reason railway revenues were less during the first six months of 1914 than they had been during the peak load of the corresponding six months of the previous year, nevertheless the Company entered upon the fiscal year now under review with an actually large traffic and a large turnover of revenue. The flame of war which burst forth all over Europe at the beginning of August, 1914, had a sudden and withering effect upon industry in the South. Preparing to market the largest crop in the history of cotton growing in the United States, the Southern people were looking forward to the profits from the sale of this their chief staple as a stimulus to their purchasing power and so of every form of industry in which they were engaged. When over night they were apparently shut out by the war from the European market, which has always consumed a large part of the American cotton crop, the people of the South were thrown back upon their own resources with a disturbingly large proportion of their chief money crop on their hands and an inadequate market price in prospect. Despite several futile plans of assistance from without, the South practically suspended for a time its industrial activities. The result was a fall, as vertiginous as that of the price of cotton, in the revenues of the railways at the South, and this lean diet was protracted, with the condition which caused it, throughout the year now under review. For this Company the suddenly changed industrial situation of the South meant a loss in revenues for the fiscal year of $8,551,487.22, or 12.09 per cent. The development of the loss was precipitous. July showed a small increase in revenue, August a decrease of 1.20 per cent., September a decrease of 8.33 per cent., while in October, November, December and January the decreases in revenue were, respectively, 18.47 per cent., 20.06 per cent., 19.97 per cent. and 18.93 per cent., with gradually improving conditions during the remainder of the fiscal year, as the South again caught its breath.

It was a situation which demanded radical action on the part of management. When the first symptoms of the loss of revenues were felt, plans of retrenchment were made and were thereafter applied progressively. This action could not be brought into full effect for several months, but the effort became both evident and effective in March, 1915. The result for the year was a reduction of expenses amounting to $5,585,938.68, and a balance of income over all charges of $1,523,369.32, as compared with the similar balance (but in that case after provision for a dividend) of $2,047,776.69 carried to the credit of profit and loss at the end of the previous fiscal year. These results and the financial condition of the Company at the close of the year will appear in greater detail by reference to the Income Statement (page 30) and the General Balance Sheet (pages 34 and 35), as well as the other tables which are part of this report.

DIVIDENDS

One of the unhappy results of the year has been the necessity, once again, of suspending dividends on the preferred stock. The regular dividend was amply earned for the six months ended June 30, 1914, but consideration of it, coming before the Board in September, was postponed until it should be apparent what was the tendency of the financial condition of the Company in the crisis which had then developed. Later the Board, being confident that the Company's affairs were well in hand, declared a reduced dividend of 2 per cent. (making 4½ per cent. for the year ended June 30, 1914), but conservatively made it payable in five year scrip bearing interest at the rate of 4 per cent. per annum. No dividend for the current fiscal year was declared, or could be justified during a period of convalescence.

OPERATING CONDITIONS

The characteristic of operating conditions during the year under review has been retrenchment, both by reducing service and by the practice of greater efficiency. What has been accomplished in both these respects will appear in detail in the subsequent pages of this report. It will suffice here to point out the parallel between the conditions of this year with those of the year ended June 30, 1908. That was the year of the financial panic or 1907. The revenues of the Company were at the high tide of its history up to that time until October, 1907, when they fell rapidly and dangerously throughout the remainder of that fiscal year. Then, as during this year, the problem of management was retrenchment, severe and sustained retrenchment, during several months. Attention was called in the annual report for 1908 to what was then done. What is perhaps as significant an illustration as can be made of the contemporary tendency of the railway industry, as well as of the increased strength of the Company today as compared with 1908, is found in a comparison of what had to be done and was done then and this year. In considering these comparisons it should be remembered that because of decreases of 1.74 per cent. in the average receipts per ton mile, 7.35 per cent. in the average receipts per passenger mile and 9.33 per cent. in mail revenues per mile of road, the 1915 revenues are $2,145,093 less than they would have been had the 1908 averages been maintained on the revenue side of the account, while on the other hand operating expenses for 1915 carry an increase of approximately $3,881,418 more than those for 1908, due to increased wage scales; therefore the operations for 1915 were burdened with unavoidable decreases in revenues and increases in expenses approximating together the large sum of $6,026,511. In a comparison of actual results in the two years, 1915 has thus been handicapped to the extent of over six million dollars, which had to be overcome before increased efficiency could be observed. Under these conditions, the causes of which are too well known to all students of contemporary economics in the United States to require explanation here, the hope of the railway industry is that aggregate revenues may increase progressively in greater ratio than aggregate costs. Fortunately for this Company, the conditions making for a continued rapid development of the South, despite temporary setbacks as in this year and in 1908, have realized as well as promise such a result; while the intelligent expenditure of new capital for improvement of the plant in the interest of facility, and so of economy, of operation must in future, as in the past, be made to check, if it cannot altogether control, an abnormal increment of operating costs. A few statistics of 1915 compared with those of 1908 will serve to make the point, viz.:

SOME OPERATING COMPARISONS, 1915-1908

		Per Mile of Road.	Per Train Mile.
Gross Revenues	Increased	23.06%	24.54%
Net Revenues	Increased	29.58%	31.33%
Revenue Train Miles	*Decreased*	*1.31%*	.....
Maintenance of Way and Structures Expenses	Increased	26.44%	27.48%
Maintenance of Equipment Expenses	Increased	25.05%	26.00%
Transportation Expenses	Increased	14.51%	16.03%
Ton Miles—All Freight	Increased	35.73%	67.59%
Ton Miles—Revenue Freight	Increased	28.35%	57.90%
Freight Train Revenue	Increased	*18.98%*	.....
Freight Train Miles	*Decreased*	26.10%	55.85%
Passenger Train Revenue	Increased	16.15%	.....
Passenger Train Miles	Increased	17.09%	.78%
Revenue from Passengers	Increased	20.34%	3.59%
Taxes	Increased	35.83%	.....

Transportation costs per dollar of revenue were 36.59 cents, or 6.97 per cent. less than in 1908. Freight enginemen, trainmen and fuel costs per 100 ton miles decreased 27.29 per cent. Passenger enginemen, trainmen and fuel costs per 100 passenger miles increased 7.76 per cent.

Freight locomotive fuel costs per 100 ton miles decreased 37.19 per cent., and pounds of coal consumed per 100 ton miles were 36.93 per cent. less in 1915 than in 1908. While the average cost of coal at coaling stations was the same for both years, the average handling cost at stations was 35.71 per cent. less in 1915 than it was in 1908.

Overtime per dollar of wages was 5.20 cents in 1908; in 1915 it was 1.64 cents, an improvement of 68.46 per cent.

Adjusting the 1915 revenues and expenses to the average receipts per ton and per passenger mile, and mail revenue and wage costs to the averages and scales which prevailed in 1908, the following comparisons are found:

	1908	1915	Increase or Decrease
Cost to earn $1.00 of Gross Revenue	65.73c.	75.53c.	Dec. 12.97%
Transportation Costs per $1.00 of Revenue	31.60c.	39.33c.	Dec. 19.65%
Transportation Costs per Train Mile	66.28c.	63.93c.	Inc. 3.67%

The higher transportation costs per train mile this year are due to increased train loading, as illustrated by the following figures:

Enginemen, Trainmen and Fuel Costs —Freight:			
Per Train Mile	30.12c.	33.37c.	Dec. 9.74%
Per 100 Ton Miles	7.88c.	14.62c.	Dec. 46.10%

MAINTENANCE:

The obvious and easy method of retrenchment on a railroad, in an emergency, is to reduce unduly the appropriations for upkeep of the property. During the past year the management has steadfastly sought to avoid this temptation. Public announcement was made that retrenchment was necessary and that it was the policy of the Company to reduce its expenses at the cost of the temporary convenience of the people of the South before reducing maintenance of the railroad to the point of endangering their safety. The public accepted this announcement in good part and it has been due to the co-operation of the State Railroad Commissions and of responsible and enlightened citizens everywhere that the Company was enabled to reduce its passenger service more nearly to the requirements of current passenger traffic than it had been for several years past. This large item of retrenchment made it possible to spend on upkeep all that was necessary for the preservation of the integrity of the property. When to this policy was added the splendid response to the emergency by the officers and men charged with maintenance, it resulted that it was possible to say at the close of the year, as it is to-day, that the physical condition of the roadway and structures is better than ever it has been; that the motive power and passenger equipment are in good condition and fully up to normal and that the only deferred maintenance has been in freight car equipment, where upkeep could economically be deferred, because without traffic freight cars must stand idle in any event.

An evidence of the justice of this claim as to the physical condition of the property, as well as of the skillful and careful service of the officers and men immediately charged with the movement of trains, is found in the marked reduction of the number of personal injuries during the year, and the interesting fact that the Company carried this year more than sixteen and a half million passengers, a number equal to the population of the territory served, without fatality in a train accident to more than a single passenger, and he would not have suffered had he not been riding on a car platform in contravention of the rules made for the protection of passengers.

There was, of course, a substantial reduction in maintenance costs, as in other costs, as part of the policy of retrenchment, but, considering only those items of such costs as are included in operating expenses, the total decrease of maintenance costs was 10.61 per cent compared with a decrease of 12.09 per cent in revenues. For each dollar of revenue earned there was spent in maintenance 30.78 cents in 1915 compared with 30.27 cents in 1914.

GENERAL EXPENSES:

There were substantial reductions during the year in all the normal items of general expenses, but by reason of a charge to this account during the year of $98,191.32, representing the cost to this Company of the preparation prescribed to it for the pending Federal Valuation of its property, the total of general expenses is greater this year than last. This satement is made, not in criticism of the valuation expense, but in justice to the loyal officers who, by their sacrifice, made possible the reduction of one of the principal normal items of the account known as General Expenses.

CHARACTERISTICS OF TRAFFIC DURING A YEAR OF DEPRESSION.

FREIGHT:

The effect on the Company's freight business of the conditions which have obtained during the year is expressed in a decrease of 3,754,044 tons of commercial freight.

This decrease was chiefly in manufactures and in raw materials, the principal items being:

Bituminous coal and coke	1,463,489 tons.
Manufactures and miscellaneous	1,134,422 tons.
Forest products	939,687 tons.

These decreases reflect curtailment of industrial and building operations and economies practiced by the people of the South during a period of business depression.

The decrease in manufactures and miscellaneous includes approximately

500,000 tons of fertilizer and fertilizer material, and this decrease is directly attributable to the war.

The war in Europe, by narrowing the market for cotton while broadening the demand for many other farm products, has given great impetus to the movement which was already under way for the broader diversification of Southern agriculture. With relatively a small reduction in cotton acreage, the South is now producing a much larger proportion of the grains, forage crops, and meat and dairy products that it consumes. While one of the effects of this is to reduce the tonnage of agricultural products carried into the South, it is adding to the economic strength of the section, and the consequent increased purchasing power of its rural population may be expected, under normal business conditions, to result in the increased carriage of all classes of commodities except agricultural products; while the reduced movement of agricultural products into the South will be, in a measure, compensated for by an increased movement of these products between Southern points and from the South to outside markets. This change in the character of the Company's traffic is already noticeable. Thus during the year there was no decrease in the tonnage of agricultural products as a whole, viz.:

	1915, Tons	1914, Tons
Grain	655,513	756,215
Hay	150,662	165,902
Leaf Tobacco	169,126	158,919
Cotton	734,539	735,869
Cotton Seed	359,734	316,599
Melons	65,664	59,368
Citrus Fruits	60,557	53,686
Other Fruits and Vegetables	291,358	236,552
Peanuts	20,659	24,179
	2,507,812	2,507,289

The maximum grain tonnage handled by the Company in any one year was in 1906-1907, namely, 1,012,692 tons. The tonnage for the year just closed represent a shrinkage from this maximum of 35 per cent and reflects the effort of the Southern farmer to feed himself and emerge from a condition of dependence upon the grain fields of the West. Coincident with this economic change, the South is increasing other classes of agricultural products which find market largely outside the territory of production. Comparing the same years (1906-1907 with 1914-1915) the Company's tonnage of melons, fruits and vegetables increased more than 100 per cent. So that, while rapidly approaching the time when the South will produce grain sufficient to feed itself, and probably have some to sell, the South is now producing fruits and vegetables to feed many of its neighbors as well as itself.

The cotton crop was the largest on record, but there was a decrease in exports in excess of 800,000 bales, yet the Company's tonnage of cotton was not appreciably less than during the previous year, the difference being aprpoximately 5,000 bales, and this was more than compensated for by an increase in tonnage of cotton seed and its products of 168,282 tons, due to a large crop and to a strengthened position with relation to the seed crushing industry. It is interesting to note that, compared with 1906-1907, the tonnage of cotton seed and its products for the year just closed represents an increase of 168 per cent.

The South has had but a small part in the business of supplying munitions of war for the armies in Europe, but in the latter months of the year the Company handled a substantial movement of horses from the west and southwest destined to the battlefields. In all some 20,000 horses were so transported for export. Special arrangements were made for the prompt and comfortable movement of these unfortunate animals, and, by preventing loss and damage in transit, this business was profitable to the Company.

The South enters the new year with a much more hopeful outlook, which, it is fairly expected, will be reflected in freight revenues.

PASSENGER:

For the past twenty years, up to the third week in July, 1914, the passenger revenues of the Company have shown increases, month after month, over corresponding periods of the previous years, except during the period December, 1907, to April, 1909, when decreased passenger revenues resulted from a passenger fare reduction in the States of Virginia, North Carolina, Georgia and Alabama, along with a general depression in business during the latter part of the year 1907 and the first part of the year 1908.

Since the third week in July, 1914, passenger revenues have shown decreases ranging from 2.05 per cent to 34.02 per cent, the greatest decrease occuring during the second week in May, 1915, since when the passenger revenues have improved.

The increased use of automobiles, especially for short distance travel, is the only permanent cause contributing to a reduction of railway passenger travel in the South. The use of automobiles has largely increased, owing to the great reduction in the cost of the automobiles and the material improvement of the highways throughout the Southern territory. The short distance travel is principally affected by the automobile competition, and while it costs more to travel by automobile than it does by train, the automobile affords a convenience of time to which no local railway schedules can be adjusted.

The travel on the Southern Railway is of two kinds, local and competitive. Approximately 70 per cent is local, short distance travel between non-competitive stations, and 30 per cent long distance travel between points where other lines compete.

The local travel, approximately 70 per cent of the total, will increase with the agricultural and manufacturing development of the country, but during times of business depression this short distance local travel is more affected than is the through travel. The farm laborer, as well as the factory employee, travels for the most part for pleasure, and as soon as his wages are affected he quits traveling. The farmer, particularly in the cotton sections, has discontinued during the past year his old-established custom of advancing money to laborers above their actual requirements for living necessities.

The long distance competitive travel in the Southern territory is susceptible of great development, and as train service improves, as the result of double track and other physical facilities, revenues from long distance passenger travel may be expected materially to increase. While the travel from the North and the East to Southern resorts during the winter seasons increases each year, the travel of the Southern people to the mountain resorts of the Carolinas and Virginia and to the resorts in the Northern States increases to a greater extent and will continue to increase with the prosperity of the Southern people. The mountain sections of Western North Carolina grow more popular and each year attract a larger number of people for their summer vacations. The importance of this is shown by the fact that the months of July, August and September yield the Company's largest passenger revenues. But the principal development and improvement in through long distance travel may be expected to come from increased travel of business men between the Southern business communities and the Eastern and Northern commercial and banking centers. The people of the South are given to much traveling, and as their incomes, both from manufacturing industries and from farming developments, improve, that much more will they travel for business and for pleasure.

INDUSTRIAL AND AGRICULTURAL DEVELOPMENT OF THE TERRITORY SERVED

MANUFACTURING:

Although industrial development was restricted by the prevailing business depression, the ground swell of the prosperity prevailing in the South prior to the war in Europe carried over into this year a substantial addition to the manufacturing plants established on this Company's lines. While less than in former years, the record is an earnest of what may be expected in the future. The new industrial plants on the Company's lines completed during the year numbered 519 and may be classified as follows:

Brick, Tile, etc.	19
Cotton Seed Products	47
Fertilizer	7
Flour and Feed	54
Furniture	12
Iron Products	17
Lumber	57
Stone (mineral)	38
Textile	24
Woodworking	47
Miscellaneous	197
Total	519

The capital involved in these new industries is $17,492,850. During the year there were additions made to 219 manufacturing establishments at a reported cost of $8,162,047. Industries reported under construction June 30, 1915, were 57 in number with a capital of $15,456,250. New buildings of all kinds (except those used in manufacturing) and other general improvements represented an expenditure of $66,422,856.

AGRICULTURE:

The September 1, 1915, estimates of the United States Department of Agriculture show increases this year over the 1914 yields of sundry crops, other than cotton, in the Southern States as follows:

Corn	100,341,000 bushels
Wheat	6,162,000 bushels
Oats	14,253,000 bushels
Irish Potatoes	13,344,000 bushels
Sweet Potatoes	6,705,000 bushels
Hay	1,227,000 tons
Tobacco	97,923,000 pounds

The South may, this year, well quote Virgil's verse: "Gargara is astonished at her own fertility."

In these figures, as well as in the development of the cattle industry, hereafter referred to, lies a promise of an enduring, because a self-contained, prosperity in the South; they indicate, as has already been suggested, that our section may expect in the future to provide the bulk of its own food supplies, with some surplus of such commodities for sale, while it will maintain its leading position as the source of one of the principal staples upon which civilized man depends to clothe hmself.

The Company has continued active co-operation with the State and Federal governments, agricultural colleges and Southern farmers for the advancement of Southern agriculture. A preliminary report of the Agricultural Division of the Company's Industrial and Agricultural Department shows a total of 18,172 acres being cultivated in accordance with the advice of our Field Agents, embracing 7,882 acres in corn, 3,570 acres in cotton and 6,720 acres in miscellaneous crops. These figures do not by any means measure the work being done, as they embrace only those fields or parts of fields in which farmers agree to follow the advice of our agricultural field agents. Much larger areas are cultivated substantially in accordance with this advice, and the good results of the agricultural uplift work being done by the Company and, of course, by the State and Federal governments, as well as by other intelligent agencies, public and private, are noticeable in almost every agricultural community on the Company's lines. In 1914 the average yields of both cotton and corn per acre on fields in which the advice of the Company's agents was followed were more than double the average yields obtained on similar lands in the same localities where this advice was not followed, and as good results may be expected in 1915, when the figures are available.

The Agricultural Agent reports 313,000 fruit and nut trees planted during the year.

The live stock industry is making rapid progress in all of the territory contiguous to the Southern Railway. The numbers of beef and dairy cattle and hogs are rapidly increasing, and their quality is being improved through the introduction of pure-bred animals. The Live Stock Agent of the Company reports the location of 1,468 pure-bred cattle along the Company's lines during the year, the construction of 1,475 silos, and the organization of thirty live stock associations. The climate of the South and the large range of forage crops that can be produced are exceptionally favorable to all kinds of live stock, and the United States Department of Agriculture has demonstrated that beef and pork can be produced cheaper in the South than in other parts of the United States. The only obstacle to the development of the beef and dairy industries has been the cattle tick which carries the germ of Texas fever. The agricultural agents of the Company are co-operating with State and Federal agencies in the eradication of this insect. Large areas along the Company's lines have already been released from the cattle tick quarantine and large additional areas will be released in the autumn of this year.

GOOD ROADS:

Recognizing the importance of good country highways to the development of the territory traversed by its lines, the Company has, at all times, co-operated with the Office of Public Roads in the United Staes Department of Agriculture and other organizations engaged in the promotion of the good roads movement. The latest figures for road construction are those for the calendar year 1914, which show that during that year there were approximately 5,400 miles of improved roads built in counties traversed by Southern Railway lines, and that in the same year those counties issued bonds for road construction aggregating $5,000,000. The total length of improved country highways in those counties at the end of the calendar year was approximately 50,000 miles.

LATIN-AMERICAN TRADE:

One of the interesting developments of the public service of a private corporation which looks forward, as does this Company, is its educational activities. Attention has been called to the notable work of this kind in behalf of better agriculture. Another work, germane to that in agriculture, has been the stimulation of the people of the South to take advantage of

current opportunities for a mutually profitable trade with Latin America. While this Company's South American Agency has been in operation only a short time, it has already laid the foundation of a foreign trade which is entirely new to many manufacturers in the South, and, while the beginnings are necessarily small, they contain the germ of what can become an important factor in the industrial activities of the South and so in the revenues of this Company. One interesting result of this movement is that fifteen thousand school children are now studying Spanish in the schools of the South as a direct result of recommendations to educational authorities by the South American Agency.

THE ADDITIONS TO CAPITAL ACCOUNT AND TO PROPERTY INVESTMENT

In the matter of additions and betterments the policy of the Company is better railroad, not more railroad. All suggestions of buying or building new railroads into new territory have been laid aside, and, in justice to the urgent demands of the existing property in the interest of economy of operation and convenience of the public served, cannot be properly considered at this time.

The Company has been fortunate in its ability to continue and to push forward, during this year of depression, the additions to its plant which will be necessary, before they can be completed, to handle the traffic of the industrial South. The capital for this work was provided during 1914, and its disbursements during the current year, when most other construction work had been suspended in the South, has not only enabled the Company to get more for a dollar invested than ever before, but has contributed substantially to the welfare of many Southern communities, which were refreshed, when they most needed refreshment, by the flow of our money through all the arteries of the commercial body. In this connection special attention is called to the table (page 45), included for the first time in this report, which sets forth the use and application of all the bonds issued by the Company since its organization.

During the year the investment in Road and Equipment increased $11,021,684.56, of which $9,004,934.79 was in Roadway and Structures and $2,016,749.77 was in Equipment. This increase represents net additions made during the year. (See pages 36 and 37).

There was an increase of $1,551,000 in Mortgage and Collateral Trust Bonds and Miscellaneous Obligations, and a decrease of $3,193,000 in Equipment Trust Obligations. (See pages 42 and 43).

First Consolidated Mortgage Five per cent Bonds in the total amount of $7,136,000 were sold and the proceeds applied as follows: On July1, 1914, $2,414,000 to redeem a like amount of matured Western North Carolina 6 per cent bonds; in December, 1914, $4,722,000 to redeem a like amount of Richmond & Danville 6 per cent bonds. These transactions resulted in no increase in the funded debt, while the difference in the interest rates borne by the old bonds and the new means a reduction of $71,360 in the annual interest charges.

There were drawn and taken into the treasury $456,000. Development and General Mortgage Four per cent Bonds, representing in part the equipment trust obligations paid during the year and charged to Property Investment Account.

The total amount of Development and General Mortgage Four Per Cent Bonds available for disposition on June 30, 1915, was $32,579,000, of which $16,667,000 are pledged as collateral under Southern Railway Three-Year Five Per Cent Collateral Trust Indenture, dated March 2, 1914, leaving $15,912,000 of such bonds in the treasury.

DOUBLE TRACK:

The double track construction work on the main line north of Charlotte, N. C., carrying with it improved alignment and elimination of heavy grades, has gone forward rapidly on 100 miles of the 142 miles of main line between Washington and Charlotte operated as single track at the beginning of the past fiscal year. Of this mileage, 27 miles, between Pelham and Brown Summit, N. C., were in operation as double track at the close of the year, and it is expected that all of the remaining 73 miles upon which work is now under way will be completed before April, 1916. There were 434.03 miles of double track in operation at the close of the year.

Since the close of the fiscal year there has been made available for the provision of double track and other improvements on the main line between Charlotte, N. C., and Atlanta, Ga., the sum of $3,500,000 through the sale of First Mortgage Thirty-Year Five Per Cent (Series B) Gold Bonds of The Atlanta and Charlotte Air Line Railway Company. The work in immediate contemplation consists of the fifty-six miles between Spartanburg and Central, S. C., and the twenty-three miles between New Holland and Cornelia, Ga.

SEPARATION OF GRADE CROSSINGS:

One of the difficulties of modern railroading is the existence of grade crossings of highways with railroads. These crossings, which in some instances were actually required by the early charters, have become, with the growth of population, a menace to the public, and cause, in deplorable accidents for which those in charge of railroad trains are not always responsible, but are usually held responsible, a drain on the revenues of the Company. The increased use of automobiles in the South has accentuated this risk and this drain, and this Company is alive to the advantage of separating such grades wherever reasonably practicable. As, and when, the community recognizes its share in the responsibility and evinces a willingness to participate in the expense, much can be done, has been done and will continue to be done on our lines. Moreover, on all revision of line undertaken in connection with the policy of constructing double track, this Company has separated important and busy grade crossings wherever physically practicable and not prevented by selfish local interests. Thus, during the past year, on 100 miles of the main line on which double track has been under construction, 54 out of 73 dangerous grade crossings were eliminated, and this policy will be continued. The enormous investment required for perfection in this respect is, however, an unfortunate assurance that for many years more reliance must be placed, for the prevention of accidents at grade crossings, upon human care than upon physical elimination of risk. This is one of the most serious problems in the South, as in other parts of the United States.

YARDS AND TERMINALS:

In addition to the terminal yards at Richmond, Va., at Spencer and Winston-Salem, N. C., at Mobile and at Finley (near Birmingham), Ala., and at Forrest (near Memphis), Tenn., mentioned last year, work upon other important terminal improvements progressed during the past year, including a new yard at Denverside (near East St. Louis), Ill., new facilities for both passenger and freight traffic at Spartanburg, S. C., and the separation of busy grade crossings in several cities. Since the close of the year the modern export coal terminal at Charleston, S. C., has been put into operation. Arrangements have been made to provide a union passenger station at Macon, Ga., to meet the long continued and insistent demand for improved passenger traffic facilities in that city. New passing, side and spur tracks aggregating 89.27 miles were constructed.

AUTOMATIC ELECTRIC BLOCK SIGNALS:

These signals were placed in operation on the 190.3 miles of double track between Amherst and Whittle, Va., Danville, Va., and Pelham, N. C., Atlanta and New Holland, Ga., Austell and Howell, Ga., Knoxville and Morristown, Tenn., and Ooltewah and Citico, Tenn. It is the policy to so equip all new double track as constructed. A total of 365.6 miles of such signals was in operation at the close of the year.

SERVICE OF EMPLOYEES

There has never been a year of the Company's history in which the stockholders have had as much reason for pride in and appreciation of the officers and employees, their work, their spirit, their loyal self-sacrifice. The manner in which a grave emergency was met and dealt with illustrates at its best that discipline which distinguishes a true organization from a mere co-operative society. Our organization, whch has in recent years been built and cemented by a strict adherence to the principle of promotion for merit and reliance upon men made on the road, who have faithfully stood by during all our vicissitudes, has proven in this year of need the greatest of the Company's assets, for it has fought a losing fight and won.

ACCOUNTS AND STATISTICS

Statements of the accounts and statistics of the Company in detail will be found in the tables hereto annexed.

The accounts have been examined, as usual, by independent auditors and accountants, Messrs. Patterson, Teele & Dennis, and their certificate is made a part of this report.

Appended to this report is a minute of the resolution adopted by the Board upon being advised of the death of Alexander Boyd Andrews, for many years a Director and First Vice-President of the Company, who died at his home in Raleigh, North Carolina, on April 17, 1915.

Respectfully submitted, by order of the Board,

FAIRFAX HARRISON,
President.

TABLE 1.

INCOME STATEMENT FOR YEAR ENDED JUNE 30, 1915, COMPARED WITH YEAR ENDED JUNE 30, 1914.

1914.		1915.
	OPERATING REVENUES:	
$45,632,207.12	Freight	$40,458,857.85
19,016,098.50	Passenger	16,175,673.75
414,638.31	Miscellaneous Passenger-Train	353,842.55
1,443,151.58	Mail	1,459,883.47
1,902,563.25	Express	1,688,471.19
988,389.26	Other Transportation	931,630.35
1,068,364.41	Incidental	884,531.81
285,584.32	Joint Facility	246,618.56
$70,750,996.75	TOTAL OPERATING REVENUES	$62,199,509.53
	OPERATING EXPENSES:	
$9,283,238.66	Maintenance of Way and Structures	$8,452,117.17
12,133,828.71	Maintenance of Equipment	10,691,267.40
2,244,350.52	Traffic	2,110,466.58
25,713,747.03	Transportation	22,757,597.47
463,598.19	Miscellaneous Operations	388,228.83
1,987,879.39	General	2,019,621.01
65,993.23	Transportation for Investment—*Credit*	*244,589.87*
$51,760,649.27	TOTAL OPERATING EXPENSES	$46,174,710.59
$18,990,347.48	NET REVENUE FROM RAILWAY OPERATIONS	$16,024,798.94
2,679,389.67	RAILWAY TAX ACCRUALS	2,595,828.27
.....	UNCOLLECTIBLE RAILWAY REVENUE	28,916.09
$16,310,957.81	TOTAL OPERATING INCOME	$13,400,054.58
	NON-OPERATING INCOME:	
$212,112.35	Joint Facility Rent Income	$284,477.24
65,000.00	Income from Lease of Road	65,880.00
110,291.69	Miscellaneous Rent Income	124,440.58
26,123.51	Net Income from Rail Leased	23,280.85
1,331,794.24	Dividend Income	1,080,243.89
1,380,317.26	Income from Funded Securities	1,071,544.35
131,722.78	Income from Unfunded Securities and Accounts	504,761.05
10,044.53	Miscellaneous Income	84,289.79
3,267,406.36	TOTAL NON-OPERATING INCOME	3,238,917.75
$19,578,364.17	**Total Gross Income**	$16,638,972.33
	DEDUCTIONS FROM TOTAL GROSS INCOME:	
$601,713.96	Hire of Equipment—Balance	$837,616.06
1,052,062.51	Joint Facility Rents	1,046,522.17
1,790,637.01	Rent for Leased Roads (See Table 2)	1,621,040.59
38,276.45	Miscellaneous Rents	40,837.36
189,215.84	Separately Operated Properties	183,608.84
37.93	Interest on Unfunded Debt	2,294.52
127,118.50	Miscellaneous Income Charges	98,556.26
3,799,062.20	TOTAL DEDUCTIONS	3,830,475.80
$15,779,301.97	TOTAL AVAILABLE INCOME	$12,808,496.53
$10,053,022.78	INTEREST ACCRUED ON LONG TERM DEBT (See Table 2)	$10,156,021.65
660,565,59	INTEREST ACCRUED ON EQUIPMENT OBLIGATIONS (See Table 2)	737,784.54
.....	INTEREST ACCRUED ON DIVIDEND CERTIFICATES	32,000.00
226,008.00	DIVIDENDS ACCRUED ON SOUTHERN RAILWAY—MOBILE AND OHIO STOCK TRUST CERTIFICATES	226,008.00
10,939,596.37		11,151,814.19
$4,839,705.60	BALANCE OF INCOME OVER CHARGES	$1,656,682.34
	FROM WHICH DEDUCT DIVIDENDS ON PREFERRED STOCK:	
$1,500,000.00	No. 27 (2½%) paid in April, 1914	.....
1,200,000.00	No. 28 (Scrip Dividend—2%)	.....
$2,700,000.00	TOTAL DIVIDENDS	.....
$2,139,705.60	BALANCE OVER DIVIDENDS ON PREFERRED STOCK	$1,656,682.34

	APPROPRIATION OF INCOME:	
$91,928.91	For Additions and Betterments	$77,187.72
	For Miscellaneous	56,125.30
$91,928.91		$133,313.02
$2,047,776.69	**Balance carried to Credit of Profit and Loss**	$1,523,369.32

TABLE 3.

PROFIT AND LOSS, YEAR ENDED JUNE 30, 1915.

	Balance at Credit of this Account June 30, 1914	$18,676,904.51
	Add:	
	Credit Balance of Income for the Year	1,523,369.32
	Net Miscellaneous Credits	72,916.09
		$20,273,189.92
	Deduct:	
$425,293.47	Discount on Securities charged off during the year	
45,210.79	Property Abandoned and not Replaced	
50,923.93	Advances to Proprietary Companies written down	
521,428.19		
	Credit Balance June 30, 1915	$19,751,761.73

TABLE 4 GENERAL BALANCE SHEET, JUNE 30, 1915, AND JUNE 30, 1914

June 30, 1914.	ASSETS	June 30, 1915
	INVESTMENTS:	
$310,963,668.27	Investment in Road	$319,968,603.06
66,639,385.49	Investment in Equipment	68,656,135.26
$377,603,053.76	Total Investment in Road and Equipment	$388,624,738.32
3,676.40	Cash Deposited in Lieu of Mortgaged Property Sold	2,112,590.04
498,359.17	Physical Property—Rails and Fixtures leased to others	503,161.93
	INVESTMENTS IN AFFILIATED COMPANIES:	
$27,395,280.11	Stocks	$27,453,480.11
31,580,577.04	Bonds	31,582,577.04
1,726,831.46	Notes	2,115,080.94
1,807,044.50	Advances	2,163,429.30
51,455.00	Miscellaneous (Matured interest coupons)	51,455.00
62,561,188.11	Total Investments in Affiliated Companies	63,366,022.39
	OTHER INVESTMENTS:	
$297,473.00	Stocks	$297,506.00
10,658,913.45	Bonds	5,158,913.45
26,500.00	Notes	52,652.82
10,982,886.45	Total Other Investments	5,509,045.27
$451,649,163.89	Total Investments	$460,115,557.95
	CURRENT ASSETS:	
$2,955,208.63	Cash	$3,075,178.83
9,649,421.23	Time Deposit	2,126,700.63
7,583,393.45	Special Deposits	2,932,371.45
671,292.30	Loans and Bills Receivable	1,517,048.80
785,793.91	Traffic and Car Service Balances Receivable	884,055.85
300,384.25	Balances due from Agents and Conductors	191,527.39
3,384,911.95	Miscellaneous Accounts Receivable	3,207,412.32
5,080,699.04	Material and Supplies (Table 22)	4,530,946.24
926,711.34	Interest and Dividends Receivable	612,433.51
237,576.13	Other Current Assets	170,327.67
31,575,392.23	Total Current Assets	19,248,002.69
	DEFERRED ASSETS:	
$232,377.94	Working Funds Advanced to Agents and and Officers	$146,360.90
920,208.73	Cash and Securities in Insurance Fund	954,979.63
229,402.02	Other Deferred Assets	235,228.19
1,381,988.69	Total Deferred Assets	1,336,568.72
	UNADJUSTED DEBITS:	
$7,217.60	Insurance Premiums and Rents paid in advance	$11,809.10
190,166.84	Unextinguished Discount on Funded Debt (Proportion chargeable to Additions and Betterments to be made)	162,047.57
1,871,598.56	Additions and Betterments Expenditures in Suspense; Freight Claims in Suspense; Foreign Mileage Suspense and Sundry Items	2,283,665.64
	Securities of the Company owned by it:	
1914	1915	
$15,652,200.00	Unpledged	$16,108,200.00
18,667,000.00	Pledged	18,667,000.00
$34,319,200.00	Totals	$34,775,200.00
2,068,983.00	Total Unadjusted Debits	2,457,522.31
$486,675,527.81	GRAND TOTALS	$483,157,651.67

	LIABILITIES	
	CAPITAL STOCK:	
$120,000,000.00	Common	$120,000,000.00
60,000,000.00	Preferred	60,000,000.00
$180,000,000.00	Total Southern Railway Company Stock	$180,000,000.00
	Southern Ry.-M. & O. Stock Trust Certificates $5,670,200.00	
	Less: Owned by the Company. 20,000.00	
5,650,200.00		5,650,200.00
$185,650,200.00	Total Stock	$185,650,200.00
	LONG TERM DEBT:	
$260,048,700.00	Funded Debt Unmatured (Table 5)	$261,599,700.00
34,299,200.00	*Less*: Owned by the Company	34,755,200.00
$225,749,500.00		$226,844,500.00
18,384,000.00	Equipment Trust Obligations (Table 6)	15,191,000.00
$244,133,500.00	Total Long Term Debt	$242,035,500.00
	GOVERNMENTAL GRANTS:	
	Grants in aid of Construction	13,378.25
$429,783,700.00	Total Capital Liabilities	$427,699,078.25
	CURRENT LIABILITIES:	
$455,000.00	Loans and Bills Payable	$455,000.00
1,189,414.73	Traffic and Car Service Balances	1,156,567.52
6,798,237.51	Audited Accounts and Wages	5,415,499.79
891,729.90	Miscellaneous Accounts	633,395.38
2,788,430.65	Interest Matured, including Interest due July 1	2,740,952.65
4,673.80	Funded Debt Matured—Unpaid	22,673.80
56,502.00	Dividends Accrued—Unmatured	56,502.00
1,605,437.13	Interest Accrued—Unmatured	1,576,496.72
203,576.64	Rents Accrued—Unmatured	249,266.09
711,159.81	Other Current Liabilities	376,357.87
14,704,162.17	Total Current Liabilities	12,684,711.82
	DEFERRED LIABILITIES:	
1,371,789.37	Equipment of Leased Lines Retired; Deferred Payments Account Reconstruction Rogersville Branch; Contractors' Per Cents. Retained and Sundry Items	1,385,586.66
	UNADJUSTED CREDITS:	
$1,013,124.51	Taxes	$1,011,687.22
920,208.73	Insurance Reserve	954,979.63
1,197,071.73	Operating Reserves	1,898,431.28
14,995,466.18	Accrued Depreciation on Equipment Owned by the Company	15,333,948.50
67,339.53	Accrued Depreciation on Physical Property	74,151.18
1,695,429.12	Reserve for Accrued Depreciation on Leased Line Equipment; Expenses Accrued not Vouchered; Mileage Ticket Suspense and Sundry Items	1,521,825.57
$19,888,639.80	Total Unadjusted Credits	$20,795,023.38
	CORPORATE SURPLUS:	
$500,331.96	Additions to Property, since June 30, 1907, Through Income	$577,519.68
1,750,000.00	Appropriated Surplus not Specifically Invested	263,970.15
2,250,331.96	Total Appropriated Surplus	841,489.83
18,676,904.51	PROFIT AND LOSS—Balance	19,751,761.73
$486,675,527.81	GRAND TOTALS	$483,157,651.67

ILLINOIS CENTRAL RAILROAD COMPANY—SIXTY-FIFTH ANNUAL REPORT

REPORT OF THE BOARD OF DIRECTORS

To the Stockholders of the Illinois Central Railroad Company:

The Board of Directors submit herewith the following report of the operations and affairs of your Company for the year ended June 30, 1915:

The number of miles of road operated on June 30, 1914, was.....4,769.27

Additions for year:

January 9, 1915—Fredonia and Reeds Railroad—Reeds Junction, Ill., to Fredonia, Ill	1.77
Mileage added account of trackage rights, revision of line, and remeasurements	3.16
	4,774.20

Less:

January 9, 1915—Reclassification of first main track, Carbondale Junction, Ill., to Fredonia, Ill., as other main track, due to construction of Fredonia and Reeds R. R.	6.64	
May 26, 1915—Reduction due to construction of cut-off between Kuttawa, Ky., and Cumberland, Ky	.42	7.06
The number of miles operated on June 30, 1915, was		4,767.14
The average number of miles of road operated during the year was		4,770.03

INCOME

The following is a statement of the Company's income for the year compared with the previous year:

	1915	1914	Increase + Decrease —
Average miles operated during year	4,770.03	4,768.51	+ 1.52
Railway operating revenues:			
Freight	$41,212,270.70	$43,871,271.70	— $2,659,001.00
Bridge tolls and miscellaneous freight	3,263,246.00	3,464,624.56	— 201,378.56
Passenger	12,640,597.28	13,715,979.06	— 1,075,381.78
Bridge tolls and miscellaneous passenger	211,080.10	247,762.37	— 36,682.27
Mail	1,050,706.59	1,042,042.96	+ 8,663.63
Express	1,589,501.31	1,770,646.75	— 181,145.44
Other passenger train	457,177.96	475,668.53	— 18,490.57
Other transportation	753,786.52	804,580.88	— 50,794.36
Revenue from operations other than transportation	522,006.02	481,123.21	+ 40,882.81
Total railway operating revenues	61,700,372.48	65,873,700.02	— 4,173,327.54

Railway operating expenses:				
Maintenance of way and structures	8,839,472.06	9,205,946.38	—	366,474.32
Maintenance of equipment	13,892,443.73	14,510,079.49	—	617,635.76
Traffic expenses	1,238,439.64	1,290,777.98	—	52,338.34
Transportation expenses	22,299,815.12	24,150,039.98	—	1,850,224.86
General expenses	1,603,255.98	1,618,483.63	—	15,227.65
Transportation for investment—Cr.	303,278.88	.....	—	303,278.88
Total railway operating expenses	47,570,147.65	50,775,327.46	—	3,205,179.81
Net revenue—rail operations	14,130,224.83	15,098,372.56	—	968,147.73
Outside operations:				
Revenues	411,179.77	499,802.61	—	88,622.84
Expenses	405,049.10	517,453.45	—	112,404.35
Net revenue — outside operations	6,130.67	*17,650.84	+	23,781.51
Net railway operating revenue	14,136,355.50	15,080,721.72	—	944,366.22
Railway tax accruals	3,233,838.38	3,341,247.07	—	107,408.69
Uncollectible railway revenues	24,044.24	.....	+	24,044.24
Railway operating income	10,878,472.88	11,739,474.65	—	861,001.77
Other income	7,659,428.03	7,320,600.33	+	338,827.70
Gross income	18,537,900.91	19,060,074.98	—	522,174.07
Deductions from gross income	11,678,739.25	10,921,250.55	+	757,488.70
Net income	6,859,161.66	8,138,824.43	—	1,279,662.77
Disposition of net income:				
Applied to sinking and other reserve funds	107,875.00	.....	+	107,875.00
Appropriated for additions and betterments	46,027.77	41,642.66	+	4,385.11
Balance transferred to credit of profit and loss	6,705,258.89	8,097,181.77	—	1,391,922.88

* Deficit.

REVENUES

For the current year the operating revenues amounted to $61,700,372.48 as compared with $65,873,700.02 in the previous year, a decrease of $4,173,327.54, or 6.34 per cent.

Freight revenue amounted to $41,212,270.70, a decrease of $2,659,001.00, or 6.06 per cent. The principal portion of the decrease was on the southern lines, the northern lines showing a comparatively small decrease and the western lines an increase. The bituminous coal traffic showed a substantial increase both in tonnage and revenue over last year and there was also a heavy increase in the movement of grain through the port of New Orleans which added materially to the revenue for the year. These gains, however, were not sufficient to offset the loss in revenue due to the falling off in lumber traffic and the heavy shrinkage in merchandise and miscellaneous freight business.

The revenue from the transportation of passengers was $12,640,597.28, a decrease as compared with last year of $1,075,381.78, or 7.84 per cent. There was a substantial decrease in the revenue north of the Ohio River; but the greatest falling off in business was in the territory served by the southern lines.

Statistics as to freight and passenger traffic will be found by reference to Table No. 12.

EXPENSES

The operating expenses were $47,570,147.65 this year as compared with $50,775,327.46 last year, a decrease of $3,205,179.81, or 6.31 per cent.

MAINTENANCE OF WAY AND STRUCTURES

Maintenance of way and structures expenditures amounted to $8,839,472.06, being a decrease of $366,474.32, or 3.98 per cent, as compared with the previous year. This decrease was due in part to the smaller quantity of new rail laid in renewals and partially by the fact that the previous year's expenses were increased by substantial charges on account of the construction of the new passenger terminal at Memphis and other additions and betterments work, while the operating expense portion of additions and betterments work was not so large this year.

Included in the renewals, the cost of which was charged to operating expenses, were the following:

2,087,531 cross ties were renewed, this being equivalent to 672.92 miles of continuous track, or 8.99% of all ties in track, including sidings.

10.21 miles of track were relaid with new steel rail and 5.65 miles with second-hand steel rail, replacing rail of the same weight.

7,428 lineal feet of timber and pile bridges were replaced by embankments.

1,504 lineal feet of iron and 4,136 lineal feet of concrete pipe culverts were put in.

486 miles of ballasted track were repaired or renewed to restore the track to its original standard.

As to work, the cost of which was charged wholly or in part to "Road and Equipment," comments will be found on page 10 of this report under "Physical Changes."

MAINTENANCE OF EQUIPMENT

The expenditures for maintenance of equipment were $13,892,443.73, a decrease of $617,635.76, or 4.26 per cent, as compared with last year. The decrease is accounted for by a reduction in repairs to freight equipment, both locomotives and cars. Considering the volume of business handled the equipment was well maintained during the year.

Depreciation charges amounted to $2,076,094.24, being an increase over the preceding year of $376,478.28.

246 locomotives received general repairs this year as against 306 in the preceding year, and 404 were given thorough repairs this year as compared with 398 last year.

561 passenger-train cars received medium repairs this year as compared with 459 last year, and 148 were given heavy repairs this year as against 165 last year.

The average mileage per serviceable locomotive for the year was 27,802.

The average age of locomotives was 12.27 years this year and 12.63 years last year, of revenue freight-train cars 8.93 and 9.49 years for the respective years, and passenger-train cars 14.67 years this year and 15.62 years last year.

TRAFFIC EXPENSES

Traffic expenses amounted to $1,238,439.64 this year, a decrease of $52,338.34, or 4.05 per cent, as compared with last year.

TRANSPORTATION EXPENSES

Transportation expenses were $22,299,815.12 for the year, a decrease as compared with the previous year of $1,850,224.86, or 7.66 per cent. The reduction in the volume of traffic was, in part, responsible for this decrease; but an important saving was occasioned by the substitution on portions of the main lines of superheater locomotives of greater tractive power, resulting in the movmeent of heavier trains with but slight increase in the expense. In the freight service the increase in the average tons moved per train mile, including Company's freight, was 7.16 per cent.

A special campaign was carried on in connection with fuel economy, resulting in a decrease of 10.16 per cent in the cost of fuel for locomotives, notwithstanding the larger locomotives in service on some parts of the line and a decrease of only 6.01 per cent in engine miles. Special attention was also given to the elimination, as far as possible, of the causes for loss and damage and other claims, the result being that there was a decrease of 27.48 per cent in the amounts paid for loss and damage to freight, and of 20.69 per cent in the sums paid for all claims and damages during the year as compared with last year.

GENERAL EXPENSES

General expenses amounted to $1,603,255.98, a decrease of $15,227.65, or .94 per cent.

TAXES

The amount of taxes for the year was $3,233,838.38, a decrease of $107,408.69, or 3.21 per cent less than the previous year.

There was a substantial decrease in the amount accruing to the State of Illinois on account of the charter tax owing to the decrease in the revenues on the charter lines during the year as compared with last year. There was also a material decrease in the amount of taxes paid on the non-charter lines in Illinois and on the lines in several of the other states due to reductions in the rates of taxation.

FINANCIAL

The financial condition of the Company at the close of the year as compared with the previous year is set forth in the general balance sheet, Table No. 4, which table, together with Table No. 7, "Long Term Debt and Interest," has been stated in somewhat different form from the previous year. These changes were made in accordance with the form of balance sheet prescribed by the Interstate Commerce Commission to take effect July 1, 1914.

CAPITAL STOCK AND FUNDED DEBT

There were no changes in the Capital Stock during the year.

$1,980,000.00 of Illinois Central Equipment Trust Certificates, Series "C," were issued and sold in April, 1915.

Illinois Central Railroad Company Four and One-half Per Cent Secured Gold Notes, amounting to $10,780,000.00, matured July 1, 1914, and were retired.

Under the terms of the mortgage $2,000,000.00 Illinois Central Railroad Company First Lien Equipment Bonds were delivered to the Trustee and cancelled. An additional $881,000.00 of the same issue of bonds were also turned over to the Trustee for cancellation in connection with the sale to The Yazoo & Mississippi Valley Railroad Company of 105 locomotives released under the mortgage and which were a part of a total of 134 locomotives sold to that Company.

There were retired and cancelled under the terms of the respective Trust Agreements $800,000.00 of Illinois Central Equipment Trust Certificates, Series "A," and $350,000.00 of Illinois Central Equipment Trust Certificates, Series "B."

SECURITIES OWNED

In December, 1914, the Chicago, St. Louis & New Orleans Railroad Company issued under the terms of the Trust Agreement $5,700,000.00 of its Equipment Trust Certificates, Series "A." The Illinois Central Railroad Company purchased $700,000.00 of this issue. Of the latter amount $35,000.00 matured and were redeemed in May, 1915.

$2,586,000.00 of The Yazoo & Mississippi Valley Railroad Company Five Per Cent Gold Improvement Bonds were acquired as follows: In July, 1914, from the Trustees of the Western Lines, Omaha Division and Chicago, St. Louis & New Orleans Railroad Sinking Funds, $852,000.00; in September, 1914, from The Yazoo & Mississippi Valley Railroad Company for the purchase price of one hundred and thirty-four locomotives sold to that Company, $912,000.00; and in the same month that Company also issued and turned over to the Illinois Central Railroad Company in liquidation of indebtedness for improvements made to its property $822,000.00.

$2,500.00 par value of the Dubuque & Sioux City Railroad Company capital stock was purchased in November, 1914.

$10,000.00 par value of the Central Elevator and Warehouse Company stock was purchased in October, 1914.

In addition to the above the Company also acquired $3,600.00 par value of miscellaneous stocks.

The Company sold during the year Illinois Central Railroad Company and Chicago, St. Louis & New Orleans Railroad Company Joint First Refunding Mortgage Bonds as follows: $5,000,000.00 in February, 1915, $1,750,000.00 in March, 1915, and $3,250,000.00 in April, 1915.

There were delivered to the Trustees of the several sinking funds in exchange for The Yazoo & Mississippi Valley Railroad Company Five Per Cent Gold Improvement Bonds as above mentioned, $944,000.00 of the Louisville Division and Terminal Three and One-half Per Cent Bonds of 1953.

The Peoria and Pekin Union Railway Company redeemed $12,500.00 par value of its Five Per Cent Debenture Bonds, maturing August 1, 1914.

$86,000.00 par value of The Yazoo & Mississippi Valley Railroad Company Five Per Cent Gold Improvement Bonds were transferred to the Insurance Fund, and $30,000.00 par value were sold.

$100,800.00 par value Cuban American Sugar Company preferred stock was sold during the year.

INSURANCE AND OTHER FUNDS

The changes in the Insurance Fund during the year and the condition of the fund at the close of the year are shown in the following table:

	Year Ending June 30, 1915	Year Ending June 30, 1914
Amount at credit of fund July 1	$2,129,835.52	$2,089,844.54
Added through monthly charges to operating expenses	60,000.00	60,000.00
Collected from lessees account of insurance	1,099.92	2,106.68
Interest received on investments of the fund	107,875.00	94,630.00
Fire losses collected	12,604.82	6,941.30
	$2,311,415.26	$2,253,522.52
Losses by fire	$50,714.86	$80,479.61
Premiums paid for reinsurance	45,327.84	43,207.39
	$96,042.70	$123,687.00
Amount of credit of fund June 30	$2,215,372.56	$2,129,835.52

The balances in the sinking funds as of June 30, 1915, and the increases during the year were as follows:

The Farmers' Loan and Trust Company, Trustee—Cairo Bridge Contingent Fund, $504,180.00.

The Farmers' Loan and Trust Company, Trustee—Cairo Bridge Sinking Fund, $344,580.24, an increase of $32,412.97.

United States Trust Company of New York, Trustee—Sinking Fund for Western Lines Bonds, $1,417,887.73, an increase of $100,294.21.

United States Trust Company of New York, Trustee—Sinking Fund for Omaha Division Bonds, $192,921.50, an increase of $17,076.65.

ROAD AND EQUIPMENT

There was expended during the year for Road and Equipment (including improvements on subsidiary properties) $10,323,622.76. The following is a classified statement of these expenditures:

	Additions and Betterments on Owned Lines	Advances for Additions and Betterments to Lines of Subsidiary Companies
ROAD:		
Engineering	$32,033.80	$72,392.91
Land for transportation purposes	112,241.70	43,987.82
Grading	395,845.74	773,502.14
Tunnels and subways	356.93	.....
Bridges, trestles and culverts	434,984.44	819,451.44
Ties	36,002.33	148,473.05
Rails	174,526.95	347,765.16
Other track material	243,346.17	348,520.74
Ballast	19,326.48	149,360.12
Track laying and surfacing	120,492.58	335,814.21
Right of way fences	2,763.47	11,949.17
Crossings and signs	112,596.08	20,200.14
Station and office buildings	97,414.43	488,890.75
Roadway buildings	2,314.39	5,212.32
Water stations	5,613.72	56,602.84
Fuel stations	14,854.20	10,431.65
Shops and enginehouses	66,152.72	148,289.48
Grain elevators	828.18	11,890.31
Storage warehouses	.....	46.31
Wharves and docks	69.13	8,416.57
Coal and ore wharves	.....	26,275.88
Telegraph and telephone lines	29,676.73	18,717.18
Signals and interlockers	91,828.96	188,489.05
Power plant buildings	2,714.30	5,543.24
Power transmission systems	.....	1,909.17
Power line poles and fixtures	.....	1,336.00
Miscellaneous structures	5,084.25	812.74
Paving	69,866.11	44,542.41
Roadway machines	879.47	1,934.99
Roadway small tools	25.23	6,394.02
Assessments for public improvements	32,988.77	18,148.93
Cost of road purchased	1,500.00	.....
Other expenditures—Road	154,126.43	193,016.35
Shop machinery	33,384.13	23,765.48
Power plant machinery	23,761.86	458.86

	Covered by Equipment Trust Series "C"		
EQUIPMENT:			
Steam locomotives	$1,256,065.82	Cr. 260,280.44	*$1,749,341.90
Freight-train cars	1,078,535.52	Cr. 39,316.03	.....
Passenger-train cars	168,250.14	Cr. 123,997.17	.....
Work equipment	.....	452,213.15	.....
GENERAL:			
Organization expenses	.....	.....	291.04
Taxes	.....	1,053.62	.....
Interest during construction	.....	4,619.82	10,618.81
Other expenditures—General	.....	.....	55.00
	$2,502,851.48	$2,350,839.01	$6,093,901.80
Less amount transferred to "Miscellaneous physical property," due to change in classification	.....	623,969.53	.....
	$2,502,851.48	$1,726,869.48	$6,093,901.80

*Balance covered by outstanding C. St. L. & N. O. R. R. Equipment Trust Series "A."

The following shows the amount advanced during the year to each of the subsidiary Companies, these amounts being included in total advances shown in Table No. 6 of this report:

Chicago, St. Louis & New Orleans R. R.	$5,676,567.14
Canton, Aberdeen & Nashville R. R.	50,862.26
South Chicago R. R.	Cr. 1,964.85
Blue Island R. R.	1,898.65
Dubuque & Sioux City R. R.	188,747.36
Kensington & Eastern R. R.	12,323.99
Batesville Southwestern R. R.	1,121.58
Bloomington Southern R. R.	1,589.95
Johnston City Southern R. R.	48,679.80
Benton Southern R. R.	72,500.33
Herrin Northern R. R.	1,358.76
Fredonia & Reeds R. R.	40,216.83
Total	$6,093,901.80

PHYSICAL CHANGES

Substantial improvements were made in the physical condition of the Company's road and equipment during the year.

Below is a statement as to the more important improvements, the cost of which was charged either wholly or in part to Road and Equipment.

ROADWAY AND STRUCTURES:

During the year 90 pound new steel rail was laid on 262.23 miles of track, and second-hand steel rail was relaid on 62.74 miles, all of which replaced rail of lighter pattern.

Ninety-nine new industrial tracks were built or extended, making a net addition of 7.46 miles after allowing for industrial tracks taken up.

Four hundred and one new Company sidings were built or extended; allowing for tracks taken up there was a net addition for the year of 69.54 miles.

The second main track between Fulton, Ky., and Memphis, Tenn., which was referred to as being in the course of construction in last year's report, was completed.

In order to facilitate the handling of coal traffic a double track connection was installed between the junction of the Carbondale and Johnston City Districts, near Cambria, Ill., the length of track constructed being 1.34 miles.

A cut-off was built from Fredonia, Ill., on the Carbondale District to Reeds Junction, Ill., on the Johnston City Branch, a distance of 1.77 miles. This involved the abandonment as first main track of 6.64 miles of line between Fredonia, Ill., and Carbondale Junction, Ill.

The second main track at Parkway, Ill., was extended to Broadview, Ill., a distance of 2.46 miles, and additional side tracks were constructed for the purpose of handling passenger traffic to and from Speedway, Ill., the site of the new automobile race course a short distance east of Broadview, Ill.

At Paducah, Ky., the freight yard was added to by the construction of 6.28 miles of sidings. The freight yard at Fulton, Ky., was increased 6.59 miles.

The reduction of grades between Paducah, Ky., and Princeton, Ky., and the enlargement of yard facilities at the latter point were continued and were practically completed at the close of the year.

The elevation of the tracks at Memphis, Tenn., as also the construction of the new passenger facilities at that place, referred to in previous reports, were completed. The raising of tracks and relocating of main line in connection with levee improvements being made by the city authorities in North Memphis, Tenn., were undertaken during the yaer and are about half completed.

The grade crossing elimination work at Grand Crossing, Chicago, Ill., track elevation work between 79th Street and 116th Street, Chicago, Ill., and through Cicero, Ill., also grade revision at Mattoon, Ill., were still in progress at the close of the year.

The work of strengthening the Cairo Bridge so as to be able to operate heavy locomotives over it was performed during the year.

An interlocking plant was installed at Aulon, Tenn.

New station buildings were erected at Grand Crossing, Chicago, Ill., Marion, Ill., Buckner, Ill., Toone, Tenn., and Masonville, Ia., and others are in course of construction at Storm Lake, Ia., and Millwood, Ky. A new freight house was erected at Starkville, Miss.

The freight and passenger station at Winona, Miss., was enlarged and improvements made to the station building at La Salle, Ill.

New water plants were installed at Obion, Tenn., and Dyersburg, Tenn. Water stations were improved at Storm Lake, Ia., Rock Rapids, Ia., Sioux City, Ia., De Koven, Ky., Cecilia, Ky., Fulton, Ky., McComb, Miss., and Crystal Springs, Miss. New steel water tanks of 100,000 gallon capacity, replacing wooden tanks, were installed at Dubuque, Ia., Central City, Ky., and Jackson, Miss.

New mechanical coaling plants were erected at Amboy, Ill., and Jackson, Miss. At Harahan, La., new coal handling facilities were installed for transferring coal from cars to barges.

New mechanical buildings, consisting of car repair shed, sand house, six stall roundhouse, power house, oil and store house, were erected at Princeton, Ky., and a five stall roundhouse and machine shop, store and oil house, sand house, and car repair shop and shelter were built at Jackson, Miss. The plant within the city limits at the latter place was abandoned.

New 85-ft. steel turntables were installed at Princeton, Ky., Dyersburg, Tenn., Nonconnah Yard, Memphis, Tenn., and Jackson, Miss. A second-hand 66-ft. turntable was put in at Kenner, La.

One hundred and sixty-two miles of electric automatic block signals were constructed at various points and placed in operation. There were 1,262.4 miles of protected track at the close of the year.

Electric block signals are being installed between Branch Junction and Centralia, Ill., 4 miles; Marine to Glen Carbon, Ill., 13.7 miles; Coleman to Plato Center, Ill., 11.5 miles; and Mona to Benson, Ia., 10.7 miles; a total of 39.9 miles.

6,063 lineal feet of permanent bridges and trestles were constructed, replacing timber and pile bridges, trestles, and embankments.

1,501 lineal feet of permanent bridges and trestles were rebuilt or replaced by embankments.

29,402 lineal feet of timber and pile bridges or trestles were replaced by embankments.

EQUIPMENT:

Fifty Mikado type freight locomotives and twenty-five switching locomotives were added during the year, and sixty-eight locomotives were disposed of, resulting in an increase of seven locomotives, and an increase in tractive power of all locomotives as compared with the previous year of 1,181.65 tons.

One hundred and one passenger-train cars were acquired and thirteen were sold, destroyed or transferred to other sevice, making a net increase of eighty-eight cars.

Nine thousand three hundred and thirty-two freight-train cars were added during the year; six thousand four hundred and nineteen were new cars and two thousand nine hundred and thirteen were cars purchased from the Central Fruit Despatch; four thousand nine hundred and sixteen cars were sold, destroyed or transferred to work service, leaving a net increase of four thousand four hundred and sixteen cars. The average capacity of cars owned at the close of the year was 41.46 tons as compared with 41.52 tons last year. The total capacity of cars was 2,647,730 tons this year and 2,467,995 tons last year.

GENERAL REMARKS

Your Company during the past year has suffered from the depression in business prevalent throughout the country, and this has been most pronounced on the lines south of the Ohio River.

The crops in the territory served by your Company's lines were generally good; but the practical discontinuance of lumber exports and the general depression in the building trades seriously affected the lumber business; this, together with the low price received by cotton growers for their product, not only affected the revenue your Company received from the transportation of lumber, but also, in connection with both commodities, had a depressing effect on the revenues from the transportation of general merchandise and on passenger travel.

The substantial amounts expended by your Company during the past few years in additional facilities, as well as in the upkeep of existing tracks and structures, together with the acquisition of a large number of new locomotives of increased tractive power and cars of greater capacity than those formerly in service, enabled your Company to curtail its expenses in line with the decrease in revenue. As a result, while the total railway operating revenues decreased 6.34 per cent, the ratio of railway operating expenses to railway operating revenues was 77.10 per cent this year as against 77.08 per cent the previous year.

Under date of December 1, 1914, an equipment trust, known as the "Chicago, St. Louis and New Orleans Equipment Trust, Series 'A,'" was made in the amount of $5,700,000.00 with which to provide funds, in part, for the acquisition of 72 locomotives and 6,500 freight cars. The Illinois Central Railroad Company guaranteed the payment of the trust certificates and entered into an agreement with the Chicago, St. Louis and New Orleans Railroad Company under which your Company became the sub-lessee of the equipment covered by the lease. Under date of April 1, 1915, the Illinois Central Railroad Company issued $1,980,000.00 of equipment trust certificates known as "Illinois Central Equipment Trust, Series 'C'" for the purpose of paying, in part, for 75 locomotives and 1,000 refrigerator cars. The equipment covered by both of these trusts was received and placed in service during the year.

The Board takes this opportunity of expressing its appreciation to the officers and employees for their loyal and efficient services during the past year.

By order of the Board of Directors. C. H. MARKHAM *President.*